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PROPOSED IMPLEMENTATION PLAN FOR THE CONTROL OF PARTICULATES AND SULFUR OXIDES FOR THE STATE OF OHIO PORTION OF THE METROPOLITAN CINCINNATI INTERSTATE AIR QUALITY CONTROL REGION

SEPTEMBER 1970

Prepared for
National Air Pollution Control Administration

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1. DESCRIPTION OF THE REGION

1.1 GENERAL CHARACTERISTICS

The Metropolitan Cincinnati Interstate Air Quality Control Region (MCIAQCR) was designated by the Secretary of the Department of Health, Education and Welfare on May 2, 1969. The Region is comprised of approximately 3000 square miles of land area located in the extreme southwestern portion of Ohio and the adjacent state of Indiana and the Commonwealth of Kentucky (Figure 1-1). There is a total of nine counties, including the territorial areas of all municipalities within the counties in the MCIAQCR, namely:

Indiana

- Dearborn County
- Ohio County

Kentucky

- Boone County
- Campbell County
- Kenton County

Ohio

- Butler County
- Clermont County
- Hamilton County
- Warren County

Current estimates place the population of the Region at approximately 1.5 million persons, of which about 500,000 reside within the City of Cincinnati. The population within the Region is centered on Cincinnati with nearly two-thirds of the populace living with 15 miles of the confluence of the Ohio and Licking Rivers. Projections of future growth indicate that the total population of the Region should increase to 1.8 million by 1975 and 2.0 million by 1980.

The MCIAQCR is primarily an industrial area with about one-third of the total employment in manufacturing industries. The principal industries are aerospace, soap products, automotive, primary metals, fabricated metals, petroleum products, rubber, plastics, chemical, and machine tool manufacture. Industry is concentrated along the Mill Creek, Great Miami and Little Miami Rivers in Ohio, and the Licking River in Kentucky.

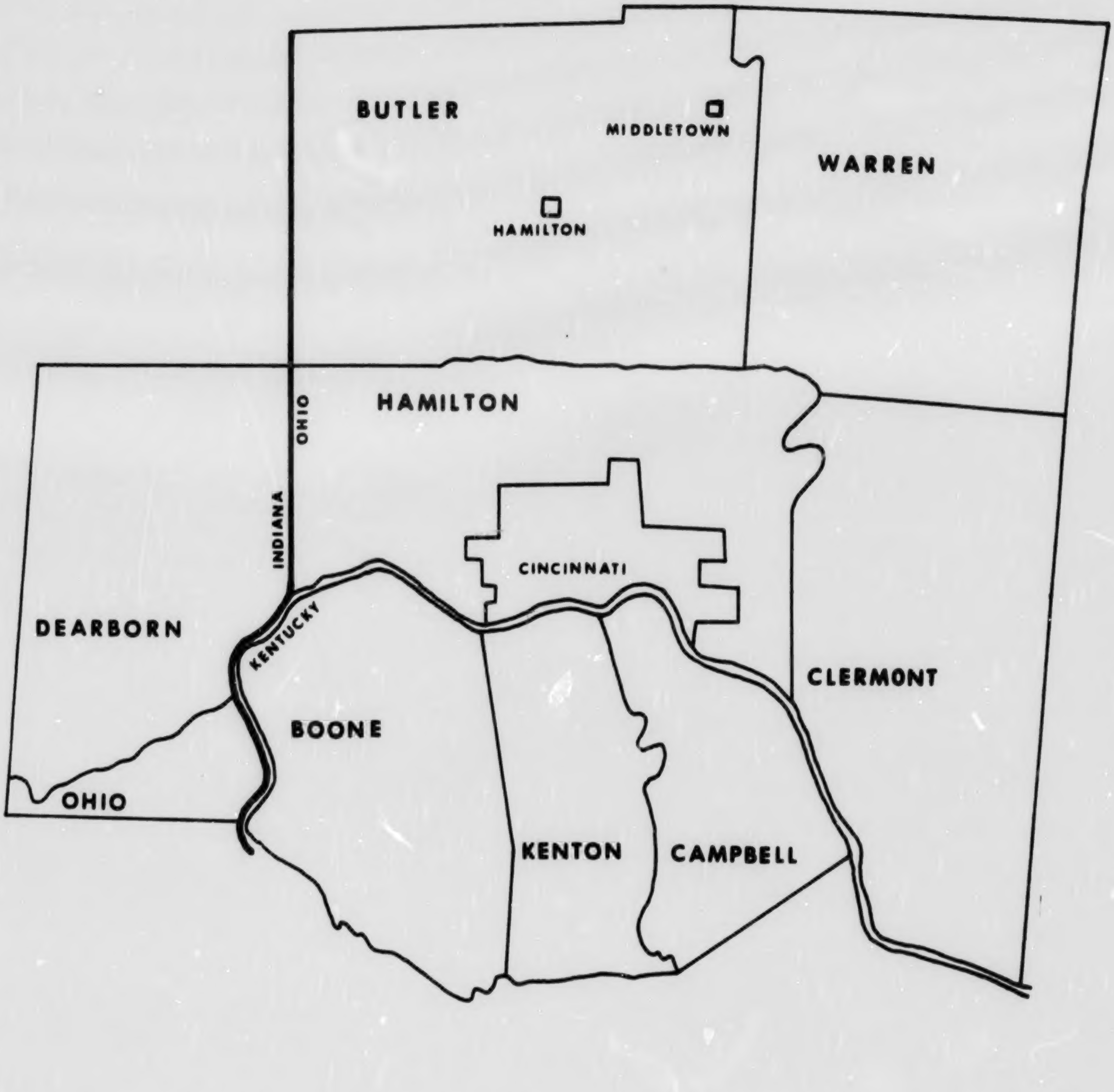

BUTLER
MIDDLETOWN
WARREN
HAMILTON
HAMILTON
OHIO
INDIANA
CINCINNATI
DEARBORN
KENTUCKY
CLERMONT
BOONE
OHIO
KENTON
CAMPBELL

Figure 1-1. METROPOLITAN CINCINNATI INTERSTATE AIR QUALITY CONTROL REGION

The major sources of sulfur oxides are related to fuel combustion with the most significant sources being the several large electric generating plants located in the Region. Fuel combustion also contributes heavily to the total emission of particulates, and again the electric power generating plants represent major point sources. Significant amounts of particulates are also emitted by industrial fuel combustion sources as well as industrial process losses. Solid waste disposal by open burning is permitted within the Region; and as a result, such sources emit large quantities of particulate pollutants.

1.2 TOPOGRAPHICAL FEATURES

The area in and around Cincinnati consists of an upland plain about 900 feet above sea level which is cut by the flood plain of the Ohio River. Hills and valleys are more pronounced in the southern and western portions of the Region. The basin area within the flood plain of the Ohio River is surrounded by steep bluffs rising 200 to 400 feet to the general level of the upland plain. These bluffs are cut frequently by the valleys of small streams which produce a setting of promontories and steep hills. In general, throughout the Region the hills and valleys have only a minimal effect on air movement; however, within the steep walled meandering valleys, the air flow is strongly influenced by the surrounding terrain.

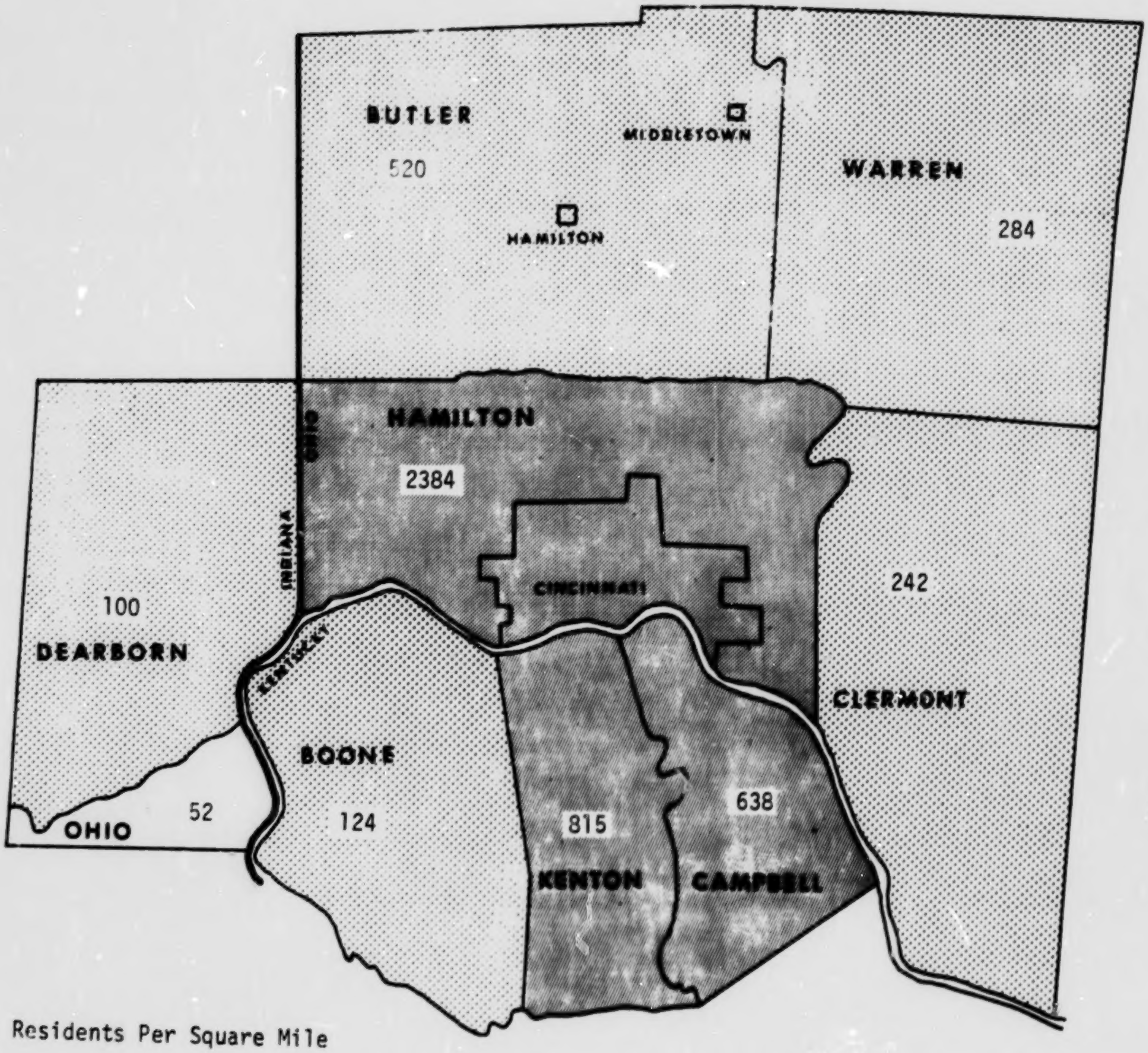
1.3 DEMOGRAPHY

Population statistics for each county and for six principal cities within the MCIAQCR are presented in Table 1-1. The City of Cincinnati with a population exceeding 500,000 accounts for one-third of the total population of the Region. The four Ohio counties include over 80 percent of the population in the MCIAQCR. Population density for the entire Region averages 494 persons per square mile but varies from 52 persons per square mile in Ohio County, Indiana, to 2384 persons per square mile in Hamilton County, Ohio. The counties of Boone in Kentucky and Warren in Ohio showed the greatest growth in the ten-year period 1960 - 1970. (Figure 1-2)

	Increase (%)	Land Area (sq.mi.)	1960	1965	Estimated 1970	Estimated 1975	1970 Density Persons/Sq.Mi.	Percent of Total Population
Indiana	3.0	739	32,936	34,301	35,320	36,340	48	2.0
Dearborn Cty.	3.0	306	28,771	29,901	30,800	31,700	100	1.8
Ohio County	2.7	87	4,165	4,400	4.520	4.640	52	0.2
Kentucky	7.3	563	230,289	242,584	260,300	278,400	462	15.1
Boone County	22.6	249	22,033	25,112	30,800	36,700	124	1.8
Campbell County	5.2	149	87,119	90,336	95,000	99,800	638	5.5
Kenton County	6.6	165	121,137	127,136	134,500	141,900	815	7.8
Ohio	9.1	1751	1,214,000	1,319,421	1,439,500	1,550,000	822	83.0
Butler County	10.6	471	199,897	221,194	244,700	268,300	520	14.2
Clermont Cty.	14.9	458	80,874	96,697	111,100	125,600	242	6.3
Hamilton Cty.	5.6	414	867,214	934,301	987,200	1,040,200	2384	56.9
Warren Cty.	25.0	408	66,015	77,229	96,500	115,900	284	5.6
MCIAQCR		3032	1,477,225	1,606,306	1,735,120	1,864,740	572	

Source: Ohio, Kentucky, Indiana Regional Planning Authority

Table 1-1. POPULATION GROWTH BY COUNTY AND FOR SELECTED CITIES
1960 - 1980


BUTLER
520
MIDDLETOWN
HAMILTON
WARREN
284
HAMILTON
2384
OHIO
INDIANA
CINCINNATI
242
100
DEARBORN
KENTUCKY
CLERMONT
BOONE
52
OHIO
124
815
638
KENTON
CAMPBELL

Residents Per Square Mile

▨ more than 500

▨ 100 to 500

☐ less than 100

Figure 1-2. POPULATION DENSITY IN MCIAQCR

1.4 METEOROLOGICAL DATA

1.4.1 Climatology

Climate of the MCIAQCR is typically continental with a wide range of temperatures from winter to summer. Summers are warm and rather humid, with temperatures reaching 100°F or more one year out of three. Above 90°F temperature occurs about 28 days each year. Winters are moderately cold with frequent periods of extensive cloudiness. However, during an average winter the temperature reaches zero or below only on two days.

The Region is subjected to frequent changes in the weather due to the passage of numerous cyclonic storms in the winter and spring and thunderstorms during the summer. Minimum precipitation occurs in the fall. Nearly one-third of the yearly precipitation occurs during the summer months when prevailing south-to-southwest winds on the western sides of the Bermuda high carry warm, moist air from the Gulf of Mexico up the Mississippi and Ohio Valleys. South-to-southwest flow predominates throughout the year with average wind speeds at Greater Cincinnati Airport between 10 to 11 m.p.h. from November to April, between 7 to 9 m.p.h. from May to September, and 9 m.p.h. over the year. Wind speeds within the city limits average about 2 to 3 m.p.h. lower than these recorded at the Airport.

Table 1-2 gives estimates of monthly mean afternoon mixing heights in meters above ground, averaged over each month and the year as a whole. These data, interpolated from values computed by Holzworth[1] for the nearest surrounding radiosonde observation stations, Joliet, Illinois, Pittsburgh, Pennsylvania, and Nashville, Tennessee, cover the 10-year period 1946 - 1955. Table 1-3 shows seasonal and annual frequencies of noctural inversions, nighttime cloud cover equal to or less than 3/10, nighttime wind speed equal to or less than 7 m.p.h. The data, adapted from Hosler[2], apply to Greater Cincinnati Airport. In the city, nocturnal inversions occur less frequently than at the airport despite the higher frequency of light winds.

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[1] Holzworth, G.C., "Estimates of Mean Maximum Mixing Depths in the Contiguous United States", Monthly Weather Review, 92, 5, 235-242 (May 1964).

[2] Hosler, C.R., "Low-Level Inversions Frequency in the Contiguous United States", Monthly Weather Review, 89, 319-339 (September 1961).

January	February	March	April	May	June	July	August	September	October	November	December
500	570	1020	1140	1250	1320	1550	1440	1200	950	670	520

Annual
1010

Table 1-2. MONTHLY MEAN AFTERNOON MIXING HEIGHTS (meters) FOR THE METROPOLITAN CINCINNATI INTERSTATE AIR QUALITY CONTROL REGION

	Winter	Spring	Summer	Autumn	Annual
(1) Inversions	25*	28	32	37	30
(2) Cloud Cover Equal to or Less Than 3/10	26	36	55	54	42
(3) Winds Equal To Or Less Than 7 m.p.h.	31	38	69	50	47

* Percent of Total Hours

Table 1-3. SEASONAL AND ANNUAL AVERAGE FREQUENCY OF OCCURRENCE OF CONDITIONS FAVORABLE FOR HIGH POLLUTION VALUES

1.4.2 Data for the Atmospheric Dispersion Model

The dispersion model used for the development of control strategies, discussed in Section 2, requires input of the following meteorological data:

- Wind: direction and speed
- Atmospheric stability
- Average mixing height

Wind and stability are combined in a 480-unit, three-dimensional frequency distribution based on 16 wind directions, six wind speed classes, and five stability categories. The data used for this analysis are listed in the Appendix in two tables:

- Table A-1. DATA COVERING THE YEAR 1965 THROUGH 1969, TO ESTIMATE AVERAGE ANNUAL GROUND LEVEL POLLUTANT CONCENTRATIONS
- Table A-2. DATA COVERING THE THREE MONTHS NOVEMBER 1969 THROUGH JANUARY 1970, FOR VALIDATING THE MODEL

Average annual and winter afternoon mixing heights for the five-year period were determined to be 1315 meters and 680 meters, respectively. These values, derived from radiosonde data for Dayton, Ohio, are higher than interpolated climatological data given in Table 1-2, which cover an earlier and longer period of record.

The model also provides for a computation of effective stack height based on Holland's Plume Rise Equation.[3] Meteorological data required for this computation include barometric pressure, here assumed to be 1000 millibars, and mean ambient temperature, assumed to be 32°F, or 273°K.

1.5 EMISSION INVENTORY

In October 1968, the Division of Air Quality and Emission Data, National Air Pollution Control Administration, completed an inventory of all sources of air pollution in the nine-county MCIAQCR. A partial emission inventory for the City of Cincinnati was completed by the Division of Air Pollution Control and Heating Inspection in December 1968. Following this, in October 1969, the Kentucky Air Pollution Control Commission conducted an inventory of sources of pollution for Boone, Campbell and Kenton Counties. The APC agencies for Ohio and Indiana conducted inventories in December 1969.

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[3] Holland, J.Z., "A Meteorological Survey of the Oak Ridge Area," USAEC Report ORO-99, Oak Ridge National Library, 1953.

Information derived from all of the above surveys was used to compile the comprehensive emission inventory upon which this Implementation Plan is based. All sources emitting more than 10 tons/year of pollutants were treated as point sources. Those with emissions less than 10 tons/year were included with the area emission sources.

The Universal Transverse Mercator (UTM) grid system was used to locate all sources of pollution in the Region. The basic grid for the Region is 100 x 100 kilometers (Figure 1-3). All points sources are located by their easting and northing coordinates. Area sources of pollution are computed for grids varying in size from 2.5 x 2.5 KM to 20 x 20 KM, the smaller grid size being used in areas with high emission densities. Area source grids are located by the easting and northing coordinates of the lower left corner of the grid.

A summary of all point and area sources of emission is presented in Table 1-4 for sulfur oxides and in Table 1-5 for particulates.* A total of 389,000 tons of sulfur oxides are emitted annually from all sources within the Region. Fuel combustion for stationary sources accounts for nearly 375,000 tons or 96.4 percent of sulfur oxide emissions. More than 82 percent of all sulfur oxides emitted in the Region comes from electric power generating plants. Even though the MCIAQCR is basically a manufacturing center, industrial process losses account for only 2 percent of the total sulfur oxide emissions.

In excess of 172,000 tons of particulate pollutants are emitted into the atmosphere within the MCIAQCR each year. Again, fuel combustion sources represent the dominant contributors of particulates, accounting for 68 percent (117,600 tons/year). Electric power generating plants are the single most important type of source in that they emit 80,8000 tons/year or about 47 percent of all particulates. Industrial process losses emit 25,000 tons and solid waste disposal 20,800 tons of particulates each year. For solid waste disposal, open burning accounts for 18,400 tons of particulates each year. The geographical distribution of point sources emitting more than 10 tons per year is presented in Figure 1-4. It is apparent that the majority of the point sources are located in Ohio with the greatest concentration of point sources in Hamilton County.

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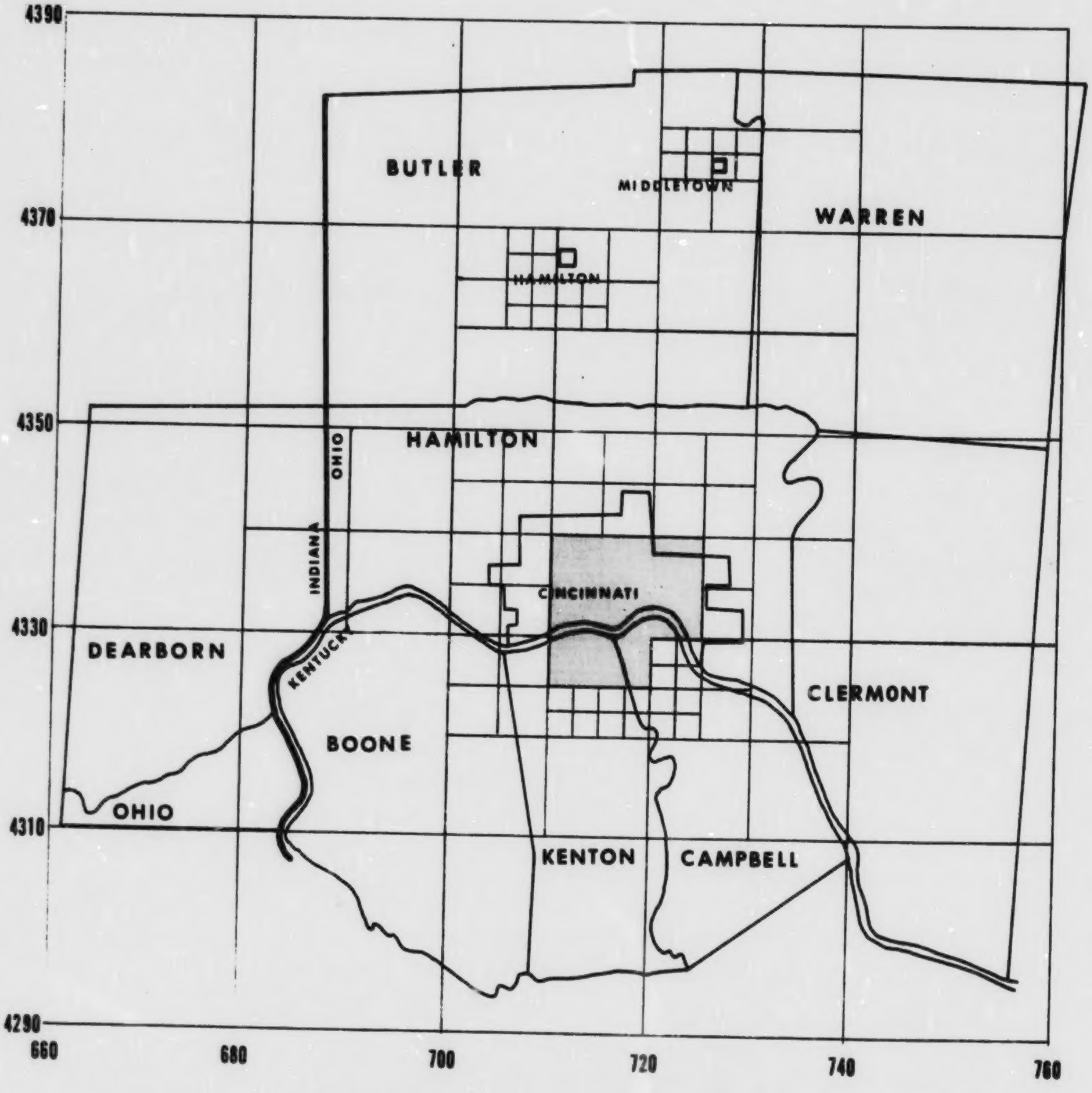
*The complete emission inventory has been supplied to NAPCA and only summary tabulations appear in this report.


4390
4370
4350
4330
4310
4290
660
680
700
720
740
760
BUTLER
MIDDLETOWN
WARREN
HAMILTON
HAMILTON
OHIO
INDIANA
CINCINNATI
KENTUCKY
DEARBORN
BOONE
CLERMONT
OHIO
KENTON
CAMPBELL

Shaded area composed of forty 1 km² areas

Figure 1-3. EMISSION INVENTORY GRID MAP SHOWING LOCATIONS AND SIZES OF AREAS INTO WHICH AREA EMISSION SOURCES WERE GROUPED

Source Category	POLITICAL JURISDICTIONS				
	Cincinnati	Indiana	Kentucky	Ohio	TOTAL
Fuel Combustion, Stationary	10,845.88	126,081.09	2,496.73	230,716.90	370,140.60
Apartments, Commercial, Government	5,765.54	463.38	1,910.15	4,956.40	13,068.47
Industrial	4,463.39	1,689.20	271.78	28,253.75	34,678.12
Power Plants	0	123,844.50	0	196,041.50	319,886.00
Residential	616.95	111.01	314.80	1,465.25	2,508.01
Fuel Combustion, Mobile	1,299.65	149.94	544.97	2,895.74	4,890.30
Gasoline Powered	984.09	107.90	404.55	2,153.08	3,649.72
Diesel Powered	315.56	42.04	140.42	742.66	1,240.68
Industrial Process Emissions	0	0	0	8,584.80	8,584.80
Solid Waste Disposal	550.81	57.33	97.16	2,552.54	3,257.84
Open Burning	113.23	57.33	97.16	2,453.99	2,721.71
Industrial	110.23	37.33	28.10	335.14	510.80
Commercial, Government	3.00	5.40	54.46	224.50	287.36
Municipal	0	14.60	14.60	1,894.35	1,923.55
Incineration	437.58	0	0	98.55	536.13
Industrial	0	0	0	0	0
Commercial, Government	47.03	0	0	0	47.03
Municipal	309.55	0	0	98.55	489.10
GRAND TOTAL	12,696.34	126,288.36	3,138.86	244,749.98	386,873.54

Table 1-4. EXISTING SULFUR OXIDE EMISSIONS IN THE MCIAQCR BY SOURCE CATEGORY AND LOCATION BASED ON 1969 EMISSION INVENTORY (tons/year)

Source Category	POLITICAL JURISDICTIONS Cincinnati	Indiana	Kentucky	Ohio	TOTAL
Fuel Combustion, Stationary	6,302.41	25,092.55	1,251.27	85,965.89	118,602.12
Apartments, Commercial, Government	2,538.80	190.72	833.93	2,166.12	5,729.57
Industrial	3,431.91	1,222.00	265.13	25,119.54	30,038.58
Power Plants	0	23,633.75	0	58,104.35	81,738.10
Residential	331.70	36.08	152.21	575.88	1,095.87
Fuel Combustion, Mobile	2,179.90	259.47	1,692.04	4,913.08	9,044.49
Gasoline Powered	1,312.11	143.86	539.39	2,870.77	4,866.13
Diesel Powered*	867.79	115.61	1,152.65	2,042.31	4,178.36
Industrial Process Emissions	365.00	91.25	7,489.80	16,968.85	24,914.90
Solid Waste Disposal	3,677.59	1,201.37	1,905.37	14,006.54	20,790.87
Open Burning	1,887.50	1,201.37	1,905.37	10,929.59	18,424.08
industrial	1,837.39	622.27	468.50	5,585.67	8,513.83
commercial, government	50.11	90.00	907.62	4,964.32	6,012.05
municipal	0	489.10	529.25	379.60	3,898.20
Incineration	1,790.09	0	0	3,076.95	2,166.04
industrial	0	0	0	0	0
commercial, government	235.19	0	0	0	235.19
municipal	1,554.90	0	0	3,076.95	1,930.85
GRAND TOTAL	12,524.90	26,634.64	12,338.48	121,854.36	173,352.38

Table 1-5. EXISTING (1969) PARTICULATE EMISSIONS IN THE MCIAQCR BY SOURCE CATEGORY (tons/year)

*Includes particulate emissions from Greater Cincinnati Airport in Kentucky

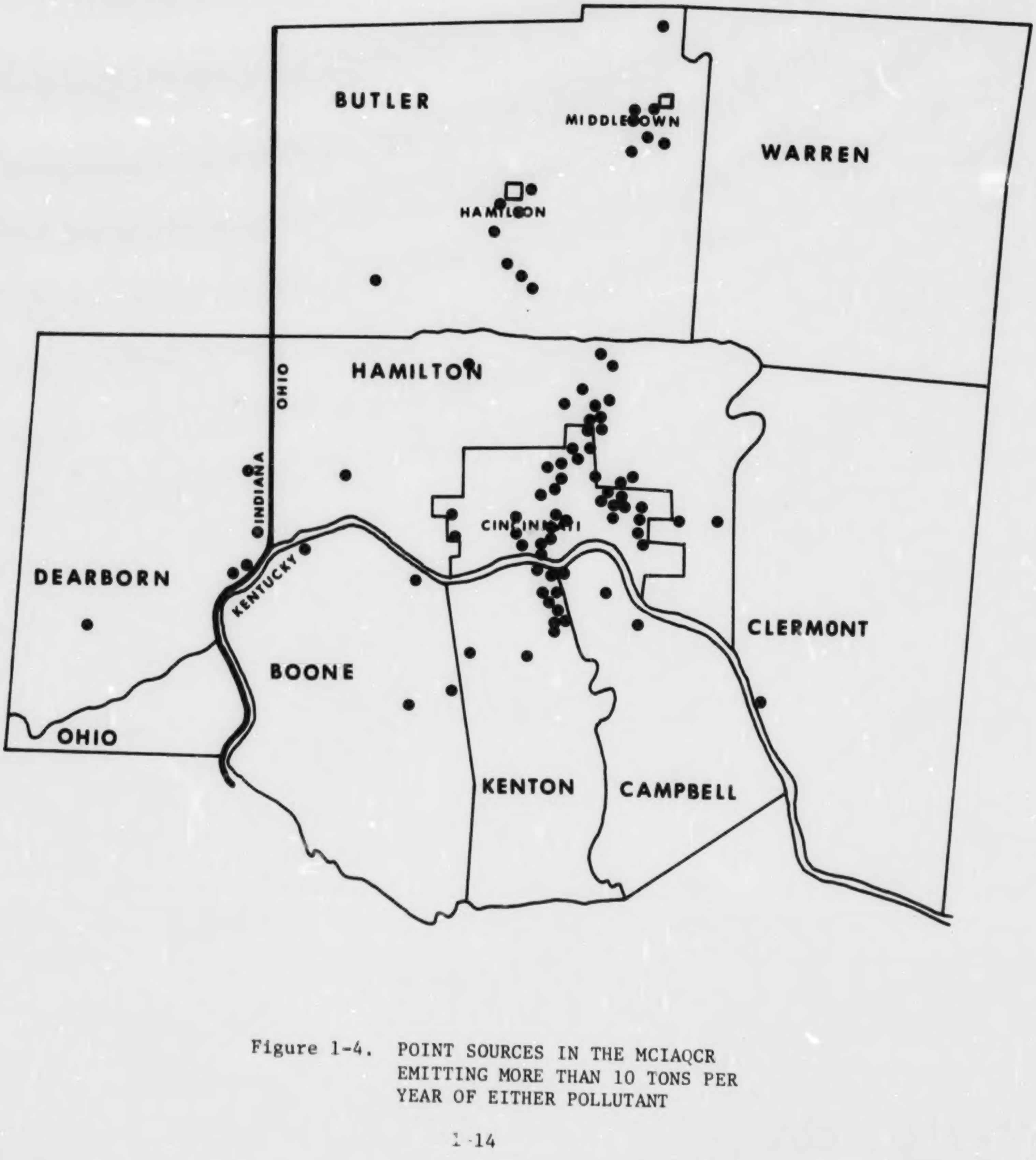

BUTLER
MIDDLETOWN
WARREN
HAMILTON
HAMILTON
OHIO
INDIANA
CINCINNATI
DEARBORN
KENTUCKY
BOONE
CLERMONT
OHIO
KENTON
CAMPBELL

Figure 1-4. POINT SOURCES IN THE MCIAQCR EMITTING MORE THAN 10 TONS PER YEAR OF EITHER POLLUTANT

There are two power generating plants in Dearborn County, Indiana, and one in Clermont County, Ohio. Emission sources located in the Cities of Hamilton and Middletown, Ohio, are shown by separate clusters to the north of the City of Cincinnati.

Contributions from area sources of emissions are presented in terms of emission densities (tons/day/km^2) for sulfur oxides (Figure 1-5) and particulates (Figure 1-6). The two pollutants show the same geographical pattern with areas of highest emission densities centered on the City of Cincinnati and the northern Kentucky cities of Covington and Newport. The Cities of Hamilton and Middletown in Butler County also show up as significant area sources for both SO_2 and particulates. Grid number 223 in Boone County shows relatively high particulate emissions as a result of aircraft activity at the Greater Cincinnati Airport.

1.6 REGIONAL AIR QUALITY

1.6.1 Sampling Stations

Measurements of ambient concentrations of particulates and sulfur oxides have been made at various locations in the MCIAQCR since 1957. For the most part, the sampling sites were located in or near the City of Cincinnati and were operated for periods of one year or less on a project basis. As a result, there is a paucity of data for the Region as a whole.

Table 1-6 lists the most recent sampling sites, identified by site numbers used on NAPCA and state and local programs. Locations are shown in UTM coordinates. At four locations, three in Cincinnati and one in Covington, measurements made under federally sponsored programs span a number of years. Station 106, operating under the Continuous Air Monitoring Program (CAMP) has an uninterrupted record dating back to 1961. Three stations, Numbers 98 and 109 in Cincinnati and 105 in Covington, are part of the National Air Sampling Network (NASN); the record for Station 109 dates back to 1957.

Further data on sampling stations are given in connection with specific projects and results discussed below.

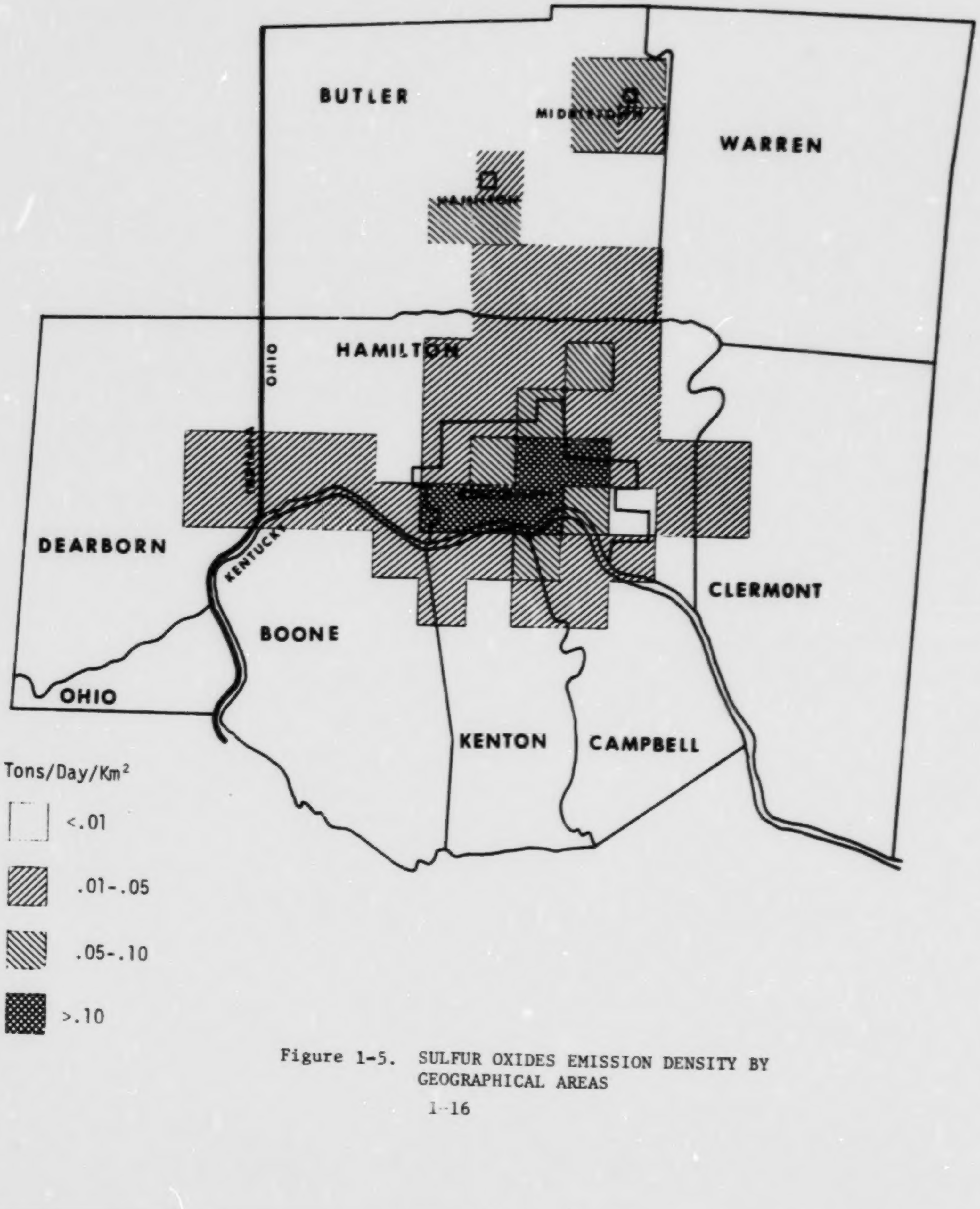

BUTLER
MIDDLETOWN
WARREN
HAMILTON
HAMILTON
OHIO
DEARBORN
KENTUCKY
CLERMONT
BOONE
OHIO
KENTON
CAMPBELL
Tons/Day/Km²
<.01
.01-.05
.05-.10
>.10

Figure 1-5. SULFUR OXIDES EMISSION DENSITY BY GEOGRAPHICAL AREAS

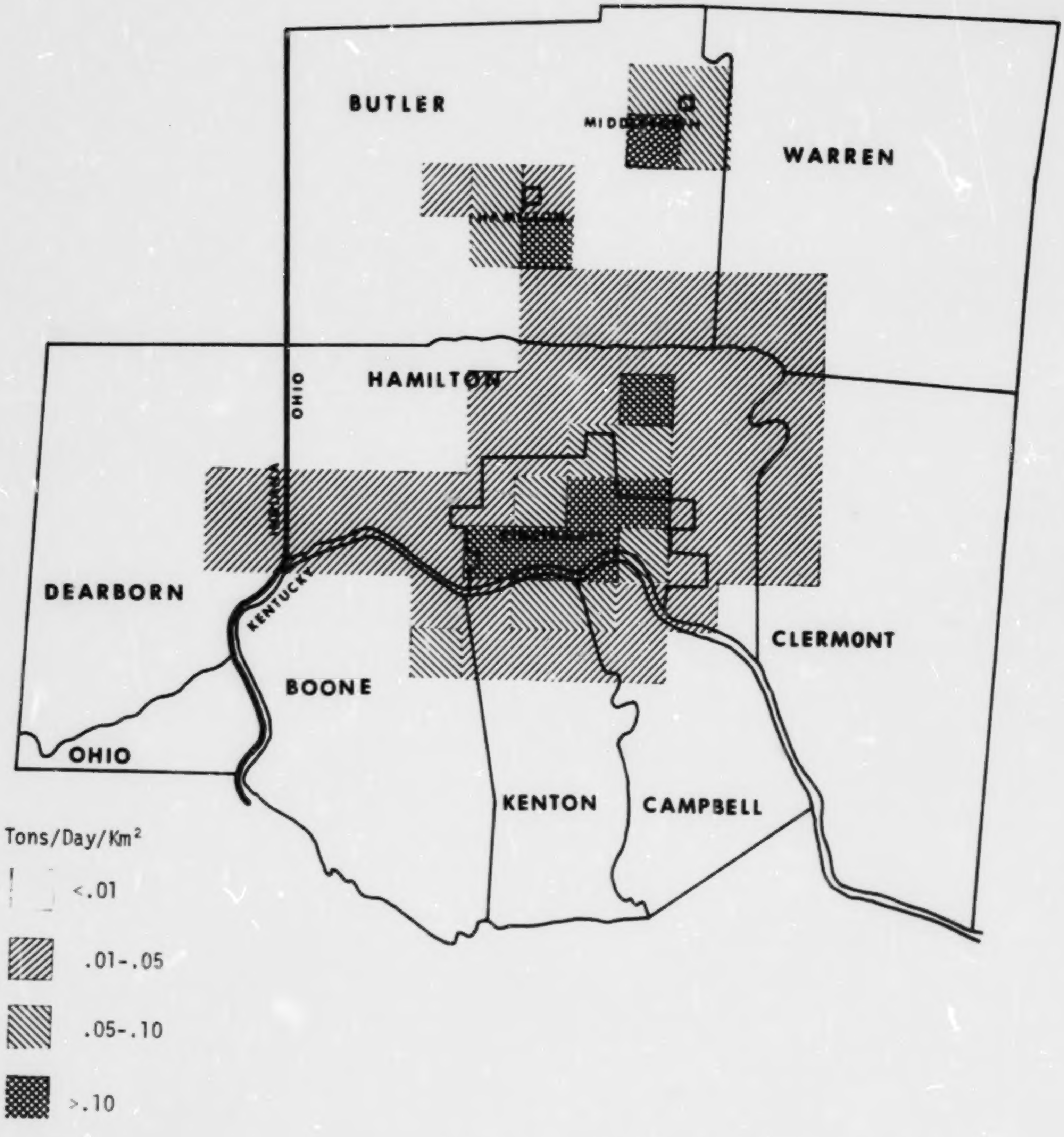

BUTLER
MIDDLETOWN
WARREN
HAMILTON
HAMILTON
OHIO
INDIANA
DEARBORN
KENTUCKY
CLERMONT
BOONE
OHIO
KENTON
CAMPBELL
Tons/Day/Km²
<.01
.01-.05
.05-.10
>.10

Figure 1-6. PARTICULATE EMISSION DENSITY BY GEOGRAPHICAL AREAS

Table 1-6. MCIAQCR SAMPLING STATIONS

STATION NUMBER		COORDINATE (kilometer)			LOCATION	
NAPCA	State & Local	Easting	Northing	Name	City or County	State
10		721.80	4331.90	Tennyson Pumping Station	Cincinnati	Ohio
39		716.20	4329.50	Newport Mall	Newport	Kentucky
42		707.00	4321.80	Erlanger City Hall	Erlanger	Kentucky
70	2	694.67	4335.75	North Bend Fire Station	North Bend	Ohio
71	3	701.27	4348.52	New Baltimore Fire Station	New Baltimore	Ohio
72	6	707.39	4340.25	Monfort Heights Fire Station	Monfort Heights	Ohio
73	13	709.37	4331.84	Seaton High School	Hamilton County	Ohio
74	16	717.73	4341.15	Seymour Fire Station	Hamilton County	Ohio
75	17	717.55	4339.31	Laidlaw	Cincinnati	Ohio
76	20	723.69	4349.82	Sharonville Elem. School	Sharonville	Ohio
77	21	719.81	4344.81	Lockland Fire Station	Lockland	Ohio
78	23	722.24	4339.72	Nativity Elem. School	Hamilton County	Ohio
79	31	729.39	4327.69	Anderson Township School	Hamilton County	Ohio
80	30	728.13	4334.13	Newton Elem. School	Newton	Ohio
81	36	740.94	4323.40	Amelia Elem. School	Amelia	Ohio
82	37	735.58	4314.80	New Richmond Fire Station	New Richmond	Ohio
83	43	709.75	4363.87	City Building	Hamilton	Ohio
84	44	708.42	5362.39	Monroe Elem. School	Hamilton	Ohio
85	45	711.69	4366.20	Hamilton No. Water Treatment Plant	Butler County	Ohio

Table 1-6. MCIAQCR SAMPLING STATIONS (continued)

STATION NUMBER		COORDINATE (kilometer)			LOCATION	
NAPCA	State & Local	Easting	Northing	Name	City or County	State
86	46	712.20	4364.40	Grant School	Hamilton	Ohio
87	47	712.03	4361.45	Van Buren Elem. School	Hamilton	Ohio
88	52	723.57	4376.70	Middletown High School	Middletown	Ohio
89	53	723.69	4374.77	Garfield Elem. School	Middletown	Ohio
90	54	727.75	4378.12	Manchester Jr. High School	Middletown	Ohio
91	55	728.42	4376.08	Creekview Elem. School	Middletown	Ohio
92	56	725.46	4374.50	Pioneer Standard Electronics	Middletown	Ohio
93	58	733.05	4381.58	Franklin High School	Franklin	Ohio
94	59	740.12	4368.94	Lebanon High School	Lebanon	Ohio
98	2	711.60	4341.60	College Hill	Cincinnati	Ohio
105		715.60	4328.80	Covington NASN	Covington	Kentucky
106		714.40	4331.60	CAMP	Cincinnati	Ohio
107		712.20	4331.60	Waste Water Treatment Plant	Cincinnati	Ohio
109		715.00	4331.20	Library	Cincinnati	Ohio
110		685.00	4331.10	Greendale Utilities	Greendale	Indiana
111		714.30	43333.30	WLW TV Tower	Cincinnati	Ohio
112		687.10	4329.30	Lawrenceburg Police & Fire Station	Lawrenceburg	Indiana
113		615.10	4329.20	IRS Building	Covington	Kentucky
114		742.10	4322.40	Volunteer Fire Department	Amelia	Ohio
202		712.80	4335.40	Highway Maintenance	Cincinnati	Ohio

Table 1-6. MCIAQCR SAMPLING STATIONS (continued)

STATION NUMBER		COORDINATE (kilometer)			LOCATION	
NAPCA	State & Local	Easting	Northing	Name	City or County	State
203		725.30	4337.90	French Bauer (Dairy)	Cincinnati	Ohio
204		727.70	4340.40	Maderia Board of Education	Maderia	Ohio
207		719.10	4336.30	Norwood Fire Station #2	Norwood	Ohio
209		711.60	4336.70	Cincinnati Gas & Electric Substation	Cincinnati	Ohio
244		715.90	4326.70	Rockcastle Motor Sales	Covington	Kentucky
245		723.32	4376.96	City Building Annex	Middletown	Ohio

1.6.2 Regional Distribution of Particulate Pollutants

Figure 1-7 shows isopleths of average annual ground level concentrations of suspended particulates measured over a portion of the Region during 1967 to 1969. The observational records used to develop this figure include those of the CAMP and NASN stations and the combined data of several measurement programs irregularly spaced throughout the period. From Figure 1-7 it is apparent that areas of high pollution are centered on Cincinnati and Newport, Kentucky, the City of Hamilton and the vicinity of the Ohio and Indiana border near the Ohio River. It will also be apparent, from the table of Air Quality Standards in Section 1.6.4 infra, that these standards are being exceeded over a significant part of the MCIAQCR. These indications are further supported by a three-month study from November 1969 through January 1970, results of which are shown in Table 1-7. All measurements reported in micrograms per cubic meter were made by means of high volume samplers ("hi-vols"). At one site, in Newport, Kentucky, soiling index (smoke shade) measurements reported in COHs per 1000 linear feet were made on an AISI tape sampler. These units are not used for Air Quality Standards and no factor to convert them to equivalent micrograms per cubic meter is universallly agreed upon.

1.6.3 Regional Distribution of Sulfur Dioxide

Ambient air monitoring data for sulfur dioxide are scarcer than for particulates, both on a regionwide and a local basis. In recent years, however, several projects were undertaken to obtain measurements of sulfur oxides, using sulfation networks, wet impingers ("bubblers"), and continuous SO_2 analyzers. Figure 1-8 shows isopleths of annual average ground level concentrations of SO_2 derived from several projects in operation during 1968-1969. Table 1-8 gives results for the three-month period corresponding to Table 1-7. Table 1-9 also covers the period November 1969 through January 1970, but the data are measurements of sulfation taken from a close network of stations. The station numbers are different from those previously listed for the Region. Coordinates are given to the nearest kilometer, measured from the origin at (660.0, 4290.0) in the UTM system.

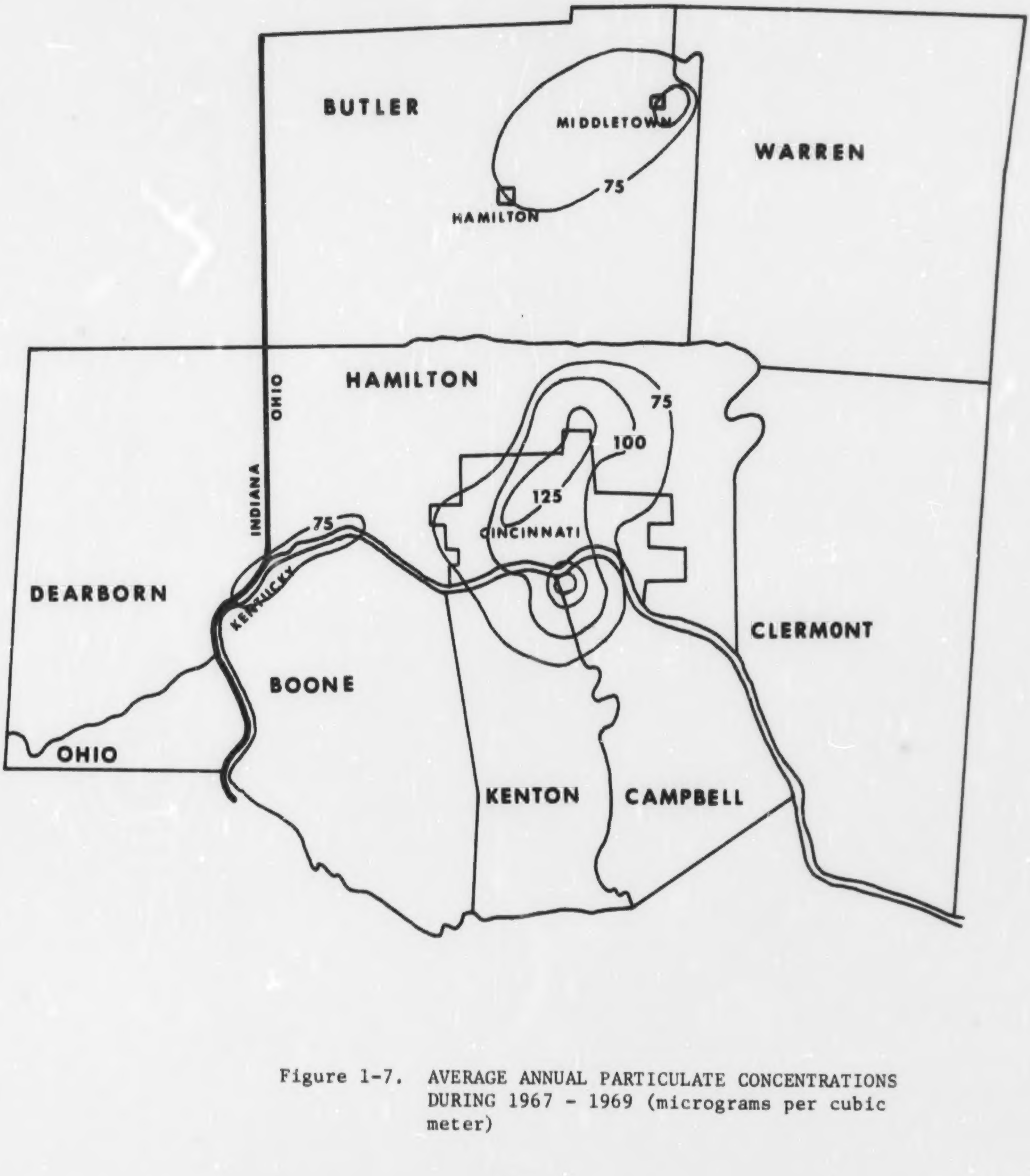

BUTLER
MIDDLETOWN
WARREN
75
HAMILTON
HAMILTON
OHIO
INDIANA
75
100
125
75
CINCINNATI
DEARBORN
KENTUCKY
CLERMONT
BOONE
OHIO
KENTON
CAMPBELL

Figure 1-7. AVERAGE ANNUAL PARTICULATE CONCENTRATIONS DURING 1967 - 1969 (micrograms per cubic meter)

Table 1 - 7 QUARTERLY SUMMARY STATISTICS FOR MCIAQCR STUDY, NOVEMBER 1969 - JANUARY 1970
POLLUTANT: PARTICULATES $\mu g/m^3$

STATION	NUMBER OF READINGS	MAXIMUM	MINIMUM	ARITHMETIC MEAN	ARITHMETIC STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STANDARD DEVIATION
10	31	178	24	77	34	70	1.55
39	29	342	59	162	67	148	1.54
42	29	191	19	62	35	55	1.67
70	30	221	24	78	42	69	1.62
71	30	191	25	71	40	63	1.62
72	30	228	28	74	44	65	1.64
73	30	263	33	70	48	61	1.60
74	28	248	30	119	66	102	1.79
75	28	281	25	126	71	108	1.78
76	30	154	27	75	32	69	1.53
77	30	426	35	136	95	111	1.90
78	30	225	11	95	42	85	1.73
79	30	108	16	53	20	50	1.45
80	31	122	25	63	24	59	1.46
81	21	131	12	67	34	58	1.78
82	29	143	28	82	34	74	1.64
83	28	244	27	85	56	73	1.73

Table 1 - 7 Continued

STATION	NUMBER OF READINGS	MAXIMUM	MINIMUM	ARITHMETIC		GEOMETRIC	
				MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION
84	31	195	15	56	41	47	1.80
85	30	333	28	90	74	73	1.81
86	31	211	27	78	39	71	1.55
87	27	140	28	66	27	61	1.51
88	30	196	49	93	35	88	1.43
89	27	212	37	99	45	89	1.63
90	30	130	26	64	26	59	1.50
91	28	188	15	74	37	66	1.70
92	28	344	50	128	65	115	1.61
93	28	156	20	68	32	62	1.59
94	19	103	21	56	23	52	1.53
98	30	213	29	68	41	60	1.65
105	70	203	52	113	66	98	1.79
106	48	233	49	110	44	102	1.45
107	30	276	26	107	60	93	1.71
109	31	248	35	102	49	93	1.53
110	31	187	26	67	36	59	1.64
111	29	250	40	89	50	80	1.54
112	13	148	41	85	35	79	1.51

Table 1 - 7 Continued

STATION	NUMBER OF READINGS	MAXIMUM	MINIMUM	ARITHMETIC MEAN	ARITHMETIC STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STANDARD DEVIATION
113	28	219	31	89	46	79	1.58
202	31	443	39	135	86	117	1.68
203	25	160	31	92	31	87	1.43
204	22	228	48	95	40	89	1.44
207	27	244	42	100	47	91	1.54
209	30	211	30	83	47	73	1.64
244	24	196	50	105	36	99	1.40
			ADDENDUM				
		Pollutant:	Particulates	Units:	Soiling Index, COHs/1000 linear feet		
039	725	260	0.00	0.34	0.39	0.22	2.76

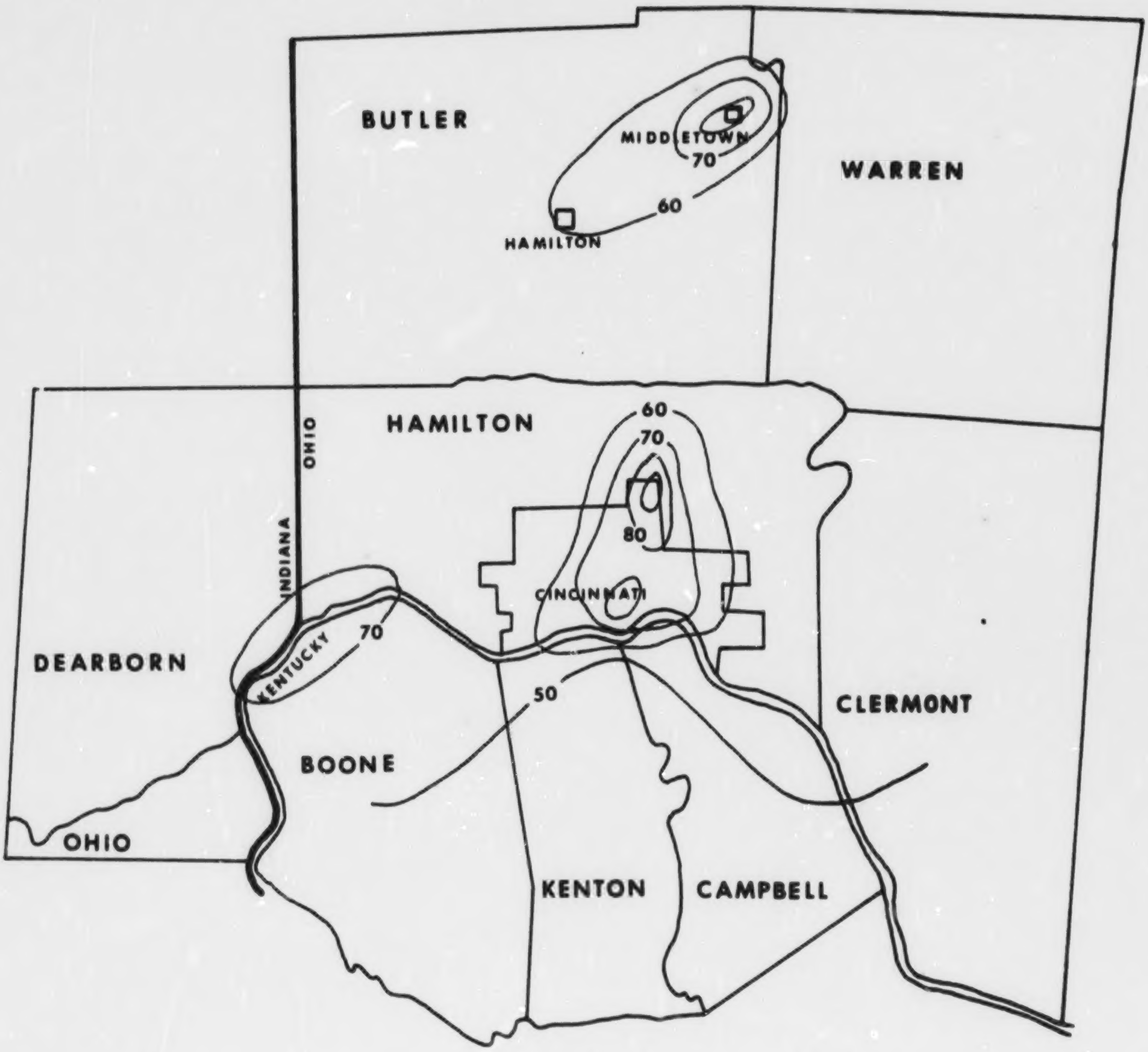

BUTLER
MIDDLETOWN
70
60
HAMILTON
WARREN
HAMILTON
OHIO
INDIANA
60
70
80
CINCINNATI
KENTUCKY
70
DEARBORN
50
CLERMONT
BOONE
OHIO
KENTON
CAMPBELL

Figure 1-8. ANNUAL AVERAGE SO_2 CONCENTRATIONS DURING 1968-1969 (micrograms per cubic meter)

Table 1 - 8 QUARTERLY SUMMARY STATISTICS FOR
MCIAQCR STUDY. NOVEMBER 1969 - JANUARY 1970
POLLUTANT: SO_2 UNITS: ppm

STATION	NUMBER OF READINGS	MAXIMUM	MINIMUM	ARITHMETIC MEAN	ARITHMETIC STANDARD DEVIATION	GEOMETRIC MEAN	GEOMETRIC STANDARD DEVIATION
39	(1) 6	.018	.002	.008	.008	.005	2.78
	(2) 513	.290	.000	.020	.027	.014	2.44
70	(1) 30	.130	.005	.028	.027	.020	2.37
75	(1) 22	.045	.010	.027	.011	.024	1.58
	(3) 1659	.150	.000	.023	.019	.018	2.08
77	(3) 1906	.350	.000	.033	.037	.023	2.29
82	(1) 29	.040	.005	.016	.011	.013	1.93
83	(3) 1144	.150	.000	.022	.026	.151	2.59
105	(1) 6	.025	.010	.016	.006	.015	1.44
106	(1) 6	.020	.005	.012	.005	.011	1.60
	(2) 2079	.250	.000	.031	.028	.023	2.18
109	(1) 5	.015	.005	.008	.004	.007	1.67
110	(1) 27	.075	.000	.027	.025	.017	3.14
114	(1) 25	.055	.005	.018	.012	.014	1.95
203	(1) 28	.040	.005	.021	.009	.018	1.73
245	(3) 1171	.140	.000	.029	.024	.022	2.28

(NOTE)
(1) Wet Impinger, West-Gaeke & Pate Technique
(2) Colorimetric, Continuous Analyzer
(3) Coulometric, Continuous Analyzer

Table 1-9 MCIAQCR SULFATION DATA Nov. 1969-Jan. 1970

Station	County	Coordinates	μg $SO_2/cm^2/day$ Nov.	 Dec.	 Jan.	 $\bar{X}_*$
1	Dearborn	25, 39	6	11	15	11
2	Dearborn	24, 37	3	6	10	6
3	Dearborn	23, 38	5	12	14	10
4	Dearborn	25, 38	6	10	14	10
5	Dearborn	26, 39	7	6	15	9
6	Hamilton	28, 41	6	12	15	11
7	Hamilton	29, 42	9	10	14	11
8	Hamilton	31, 42	10	13	21	15
9	Hamilton	32, 43	22	15	21	19
10	Hamilton	28, 46	4	8	14	9
11	Dearborn	27, 44	4	6	14	8
11A	Dearborn	26, 42	8	6	17	10
12	Dearborn	24, 40	11	9		
13	Dearborn	24, 41	5	6	11	7
14	Dearborn	24, 42	4	8		
15	Dearborn	24, 39	6	10	18	11
16	Dearborn	22, 42	6	11	14	10
17	Dearborn	22, 41	6	11	15	11
17A	Dearborn	21, 36	2	6	11	6
18	Dearborn	21, 34	5	10	16	10
19	Boone	24, 36	4	6	14	8
20	Boone	28, 39	8	15	19	14
21	Boone	30, 37	3	6	11	7
22	Boone	29, 40	6	9	17	11
23	Boone	28, 36	7	12	18	12
24	Boone	26, 37	7			
25	Boone	22, 34	5	12	13	10
26	Boone	42, 35	6	14	18	13
27	Boone	42, 38	2	6		
28	Boone	39, 40	5	7	19	10
29	Boone	35, 44	6	11	16	11
30	Boone	33, 43	10	11	17	13
31	Boone	31, 41	10	11	19	13
32	Boone	35, 37	6	10	17	11
33	Boone	30, 32	4	6	11	7
34	Clermont	72, 32	4	4	11	6
35	Clermont	73, 31	6	3	10	6
36	Clermont	76, 31	11	2	15	9
37	Clermont	76, 30	3	3	15	7
38	Clermont	74, 31	3	2	14	6
39	Clermont	74, 29	6	5	17	9
40	Clermont	75, 26	7	4	11	7
41	Clermont	75, 25	2	6	10	6
42	Clermont	74, 27	4	2	11	6
43	Clermont	75, 29	10	9	16	12
44	Clermont	75, 30	10	8	17	12
45	Clermont	76, 28	9	12	14	12
46	Clermont	78, 27	6	11	14	10
47	Clermont	81, 29	4	4	13	7
48	Clermont	79, 34	9	6	16	10
49	Clermont	74, 37	6	5	14	8
50	Hamilton	65, 40	3	3	10	5

* arithmetic mean

Station	County	Coordinates	Nov.	Dec.	Jan.	$\bar{X}$
			$\mu g\ SO_2/cm^2/day$			
51	Hamilton	65, 38	3	3	7	4
52	Hamilton	68, 37	5	5	8	6
53	Hamilton	70, 36	6	3	13	7
54	Campbell	60, 36	4	10	10	8
55	Campbell	65, 33	5	10	10	8
56	Campbell	70, 32	4	8	6	6
57	Campbell	69, 30	4	9	7	7
58	Campbell	70, 31	5	13	14	11
59	Campbell	72, 29	2	7	8	6
59A	Campbell	72, 28	2	5	6	4
60	Campbell	70, 27	6	10	13	10
61	Campbell	72, 26	2	5	8	5
62	Campbell	73, 27	3	8	10	7
63	Campbell	73, 28	4	8	9	7
64	Campbell	72, 29	3	8	10	7
65	Campbell	79, 17	3	6	8	6
66	Campbell	77, 21	3	3	8	5
67	Campbell	75, 21	3	13	13	10
68	Campbell	73, 17	3	8	9	7
69	Campbell	70, 18	8	10	13	10
70	Campbell	66, 25	6	11	14	10
71	Campbell	69, 23	4	7	9	7
72	Campbell	72, 22	6	10	12	9
73	Campbell	75, 23	3	7	9	6
74	Hamilton	63, 43		7	10	[illegible]
76	Clermont	75, 34	7	3	22	11
77	Clermont	79, 32	6	6	14	9
80	Hamilton	60, 45	5			
81	Boone	38, 30	5	10	15	10
82	Boone	33, 35	7	14	17	13
83	Boone	27, 30	5	8	10	8
84	Boone	28, 26	5	7	12	8
85	Boone	28, 21	6	8	16	10
86	Boone	41, 25	6	10		
87	Kenton	50, 30	7	11	15	11
88	Hamilton	70, 39	6	5	18	10
90	Boone	38, 36	5	9	14	9
91	Boone	33, 41	11	14	24	16
92	Boone	37, 39	7	11	19	12
93	Boone	31, 40	13	12	13	13
93A	Boone	31, 38		10	18	
94	Boone	35, 33	6	13	19	13
94A	Boone	26, 36	5	7	12	8

Station	County	Coordinates	µg $SO_2/cm^2/day$ Nov.	Dec.	Jan.	$\bar{X}$
95	Boone	31, 29	6	-	15	
96	Boone	27, 33	5			
97	Boone	24, 35	4			
98	Boone	23, 34	3	7		
99	Boone	27, 32	5			
100	Boone	43, 29	6	10	15	10
101	Hamilton	32, 57	9	11	18	13
102	Hamilton	29, 57	5	7	10	7
103	Hamilton	30, 50	2	7	8	6
104	Hamilton	33, 49	9	13		
105	Hamilton	32, 48	6	6	14	9
106	Hamilton	34, 48	8	7	10	8
107	Hamilton	34, 47	9	9	11	10
108	Hamilton	33, 44	14	6		
109	Hamilton	30, 45	9	9	16	11
110	Dearborn	22, 37	3	8	12	8
111	Dearborn	20, 47	2	7	9	6
112	Dearborn	15, 51	3	7		
114	Dearborn	09, 60	5	5	18	9
115	Dearborn	19, 59	3	4	10	6
116	Hamilton	39, 59	-	9	13	
117	Butler	30, 70	8	7	14	10
118	Butler	31, 80	3	6	11	7
119	Butler	29, 89	5	10	16	10
120	Butler	39, 89	7	10	18	12
121	Butler	39, 79	9	10	19	13
122	Butler	39, 70	8	7	18	11
123	Butler	50, 68	6	9	12	9
124	Butler	59, 69	6	8	14	9
125	Butler	59, 80	9	10	14	11
126	Butler	51, 80	5	8	12	8
127	Butler	50, 90	6	10	22	13
128	Butler	60, 90	4	7	13	8
129	Warren	70, 89	6	4	14	8
130	Warren	79, 90	6	3	13	7
131	Warren	90, 90	6	10	14	10
132	Warren	89, 80	2	5	9	5
133	Warren	80, 81	8	10	15	11
134	Warren	70, 78	6	6	12	8
135	Warren	70, 70	10	10	14	11
136	Warren	79, 70	6	7	11	8
137	Warren	90, 70	5	6	13	8
140	Dearborn	25, 41	11	11	18	13
141	Dearborn	26, 40	8	7	15	10
142	Hamilton	65, 47	5	6	13	8
143	Hamilton	67, 50	6	9	14	10
144	Hamilton	59, 46	8	8	13	10
145	Hamilton	54, 43	10	13	16	13
146	Kenton	47, 31			12	

Station	County	Coordinates	µg $SO_2/cm^2/day$			
			Nov.	Dec.	Jan.	$\bar{X}$
151	Hamilton	58, 55		7	14	
152	Hamilton	34, 45			12	
153	Clermont	75, 24		7	11	
154	Campbell	56, 39				
155	Hamilton	61, 41			14	
159	Kenton	57, 37			12	
160	Hamilton	51, 41	5	10	14	10
161	Hamilton	52, 45	6	9	-	
162	Kenton	55, 39	19		16	
163	Hamilton	57, 49	19	9	16	15
164	Hamilton	51, 45		6		
201	Dearborn	20, 37	4	4	13	7
202	Dearborn	19, 40	2	5	14	7
203	Dearborn	18, 42	6	8	18	11
204	Dearborn	16, 43	4	10	15	10
205	Dearborn	12, 44	5	10	13	9
206	Dearborn	09, 47	6	14	17	12
207	Dearborn	07, 40	2	8	15	8
208	Dearborn	13, 37	6	14	14	11
209	Dearborn	17, 35	6	8	14	9
210	Dearborn	13, 40		6	9	
211	Dearborn	11, 41	3	6	15	8
212	Ohio	26, 23	4	5	13	7
213	Ohio	23, 30	4	9	13	9
214	Ohio	20, 26	2	3	10	5
215	Ohio	17, 23	6	5	13	8
216	Ohio	18, 18	6	10	14	10
217	Ohio	06, 18	6	7	14	9
218	Dearborn	04, 25	5	9	14	9
219	Dearborn	08, 30	3	8	11	7
220	Ohio	13, 26	6	6	11	8
221	Dearborn	15, 31	5	11	14	10
222	Dearborn	13, 34	2		8	
223	Dearborn	07, 36	5	11	17	11
224	Dearborn	07, 48	6	12	16	11
250	Hamilton	60, 50	4	2	12	6
251	Hamilton	60, 56	2	5	12	6
252	Hamilton	60, 61	2	2	14	6
253	Hamilton	50, 61	2	4	18	8
254	Hamilton	50, 57	2	4		
255	Hamilton	50, 51	3	3	14	7

Station	County	Coordinates	μg SO_2/cm^2/day Nov.	Dec.	Jan.	$\overline{X}$
256	Hamilton	50, 45	5	3	14	
257	Hamilton	50, 40		-	12	
258	Hamilton	40, 41		5	12	
259	Hamilton	40, 46		7	14	
260	Hamilton	40, 51		2	11	
270	Hamilton	64, 51		11	17	
271	Hamilton	54, 48		7		
272	Hamilton	55, 45		5	14	
273	Hamilton	57, 44		6	22	
274	Hamilton	62, 47		12	15	
275	Hamilton	45, 46		5	10	
276	Hamilton	60, 53				
277	Hamilton	53, 51				
278	Hamilton	47, 42		10		
279	Hamilton	44, 39				
300	Clermont	73, 35	9	1	14	8
301	Hamilton	63, 35	4	4	12	7
302	Hamilton	71, 33	5	2	11	6
303	Clermont	76, 26	3	2	10	5
304	Clermont	77, 25	6	4	17	9
305	Clermont	80, 26	5	4	14	8
306	Clermont	80, 39	6	2	14	7
307	Clermont	90, 40	5	10	14	10
308	Clermont	89, 29	2	5	12	6
309	Clermont	73, 41	6	6	15	9
310	Clermont	77, 38	3	2	14	6
311	Clermont	80, 36	7	5	15	9
312	Clermont	77, 35	6	2	15	8
313	Clermont	77, 33	8	2	17	9
314	Clermont	77, 31	4	2	10	5
315	Clermont	78, 28	8	2	18	9
316	Clermont	77, 27	5	9	10	8
317	Clermont	78, 26	2	2	9	4
318	Clermont	82, 25	5	2	15	7
319	Clermont	79, 23	10	4	14	9
320	Clermont	75, 33	11	2	18	10

Station	County	Coordinates	µg SO_2/cm^2/day Nov.	 Dec.	 Jan.	 $\overline{X}$
321	Hamilton	70, 50	6	4	15	8
322	Clermont	80, 49	3	8	15	9
323	Clermont	90, 49	2	10	14	9
324	Hamilton	67, 45	5	3	9	6
326	Boone	25, 32	15	6	11	11
327	Boone	38, 20	18			
328	Boone	39, 10	16	6	15	12
329	Campbell	60, 39	6	8	13	9
330	Clermont	89, 20	2	4	13	6
331	Campbell	61, 30	9	10	14	11
340	Clermont	99, 09		5	13	
341	Clermont	84, 14		6	9	
342	Clermont	79, 19		4	9	
343	Clermont	90, 59				
344	Clermont	80, 59		5	9	
345	Hamilton	69, 59		6	12	
346	Hamilton	64, 45		10	17	
347	Hamilton	64, 54		9	20	
348	Hamilton	61, 54		9		
349	Hamilton	54, 54		8	15	
350	Hamilton	57, 52		7	15	
351	Hamilton	55, 41		6		
352	Hamilton	53, 40		10	15	
353	Hamilton	54, 42		9	15	
400	Campbell	66, 13		6	10	
401	Kenton	51, 21		4	8	
402	Kenton	61, 20		7	14	
403	Kenton	53, 10		8	12	
500	Hamilton	44, 55			18	
501	Hamilton	58, 47			13	
502	Hamilton	54, 46			17	
503	Hamilton	56, 43			16	
504	Hamilton	60, 42			10	
505	Hamilton	62, 40			12	

Station	County	Coordinates	Nov.	Dec.	Jan.
			$\mu g\ SO_2/cm^2/day$		
506	Hamilton	66, 42			15
507	Hamilton	55, 48			15
508	Campbell	58, 42			10
509	Hamilton	60, 49			
510	Hamilton	63, 39			9
511	Hamilton	51, 54			14
512	Hamilton	46, 58			16
513	Hamilton	54, 59			14
514	Hamilton	59, 59			15
515	Hamilton	65, 58			18
516	Clermont	75, 47			9
517	Hamilton	69, 47			18
518	Hamilton	43, 49			11
519	Hamilton	43, 43			14
520	Hamilton	46, 52			10
521	Clermont	73, 48			11
522	Hamilton	70, 43			10
523	Hamilton	75, 44			10

Table 1-10. AIR QUALITY STANDARDS FOR MCIAQCR
(concentrations in micrograms per cubic meter)

State	SULFUR OXIDES				PARTICULATES		
	Annual	Monthly	24 Hours	1 Hour	Annual	24 Hours 1 Percent[3]	Maximum
Indiana	43(AM)[1]		286	1201	75(GM)	200	200
Kentucky	57(GM)[2]	143	286	858	65(GM)	180	220
Ohio	43(AM)		286	858	65(GM)	200	260

[1] AM - Arithmetic Mean

[2] GM - Geometric Mean

[3] Concentration not to be exceeded more than 1 percent of the time

1.6.4 Air Quality Standards

The Air Quality Standards adopted by the States are shown in Table 1-10. These are the goals which the implementation planning process must be designed to achieve. Although the standards vary somewhat from state to state within the Region, these discrepancies are not significant enough to prevent effective regionwide planning for air pollution control. Indeed, considering the transport of pollution from one section of the Region to another, there appears to be no reason why control strategy development cannot proceed on a regional basis leading to the eventual adoption of uniform emission control regulations throughout the Region.

1.7 SAMPLING RECORDS IN OHIO

1.7.1 Station Locations

Figure 1-9 shows the locations of past and present stations within the Ohio four-county section of the MCIAQCR at which air quality sampling has been conducted. The first station was put into operation in 1957 at the Cincinnati Public Library, Eighth and Vine Streets, identified in the figure as Station No. 109. At this site, 24-hour measurements of suspended particulate by means of high-volume samplers (hi-vol) have been made biweekly. In 1962 the National Air Sampling Network program (NASN) added 24-hour, biweekly measurements of SO_2 by the West-Gaeke technique. More recently, a second NASN station, No. 98 in the figure, was installed in the College Hill area of Cincinnati.

Under the Continuous Air Monitoring Program (CAMP), an air sampling station was located in October 1961 at Central and Ann Streets, Cincinnati, shown as Station No. 106. At this site, continuous measurements of SO_2, NO, NO_2, CO, total oxidants, and total hydrocarbons have been made since 1962. Hi-vol sampling on an every-other-day basis has also been conducted at this station since 1966.

Consecutive numbers from 1 through 11 in the figure identify the stations of a special monitoring network for a study covering the period October 1967 to September 1968. Air sampling was undertaken to determine the effects of air pollution on school children. The types of air quality measurements made during this study are summarized in Table 1-11.

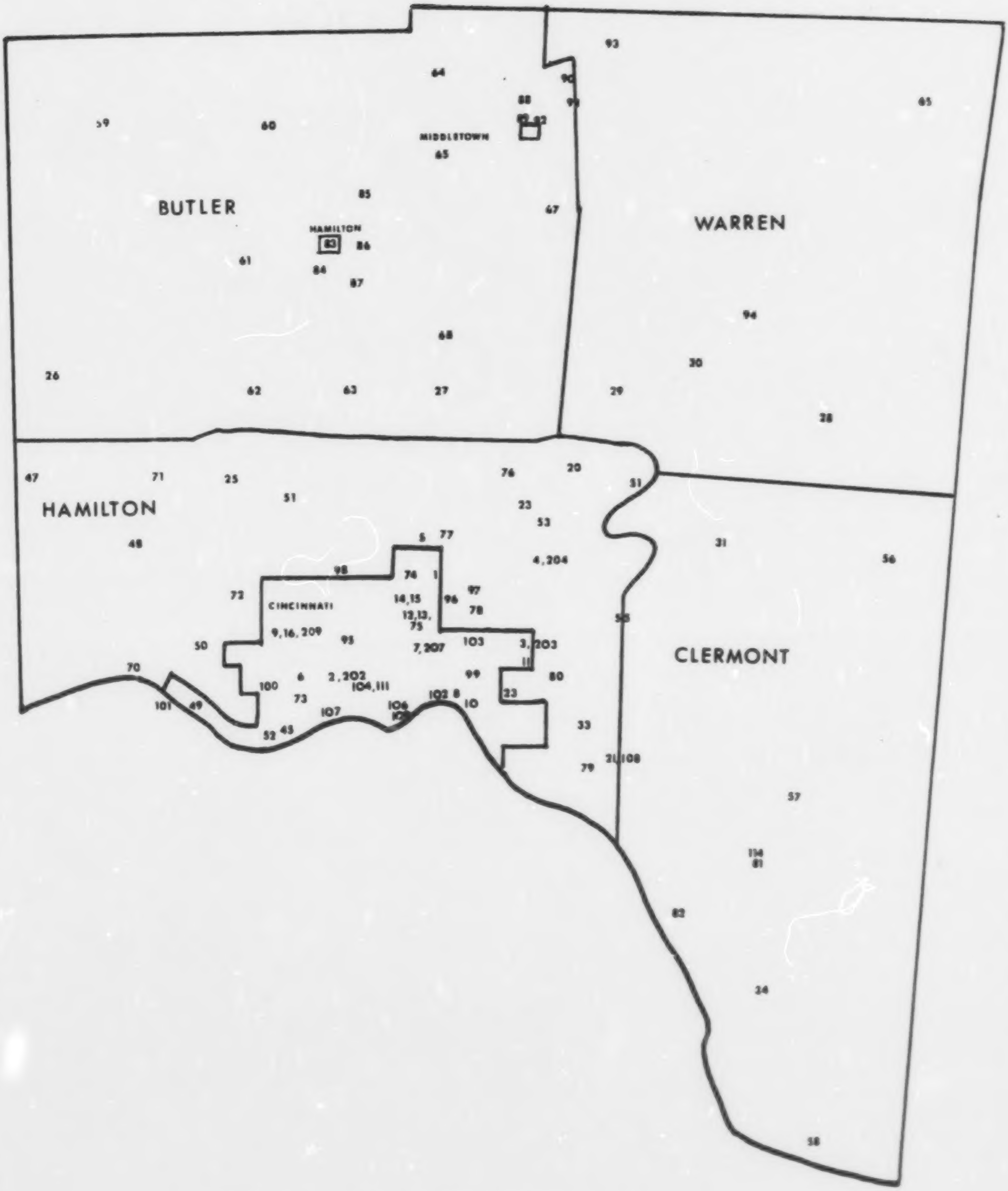

BUTLER
WARREN
HAMILTON
CLERMONT
CINCINNATI
MIDDLETOWN
HAMILTON
93
64
90
88
91
92
65
59
60
65
85
67
83
86
61
84
87
94
68
30
26
62
63
27
29
28
47
71
25
76
20
51
51
23
53
48
5
77
4,204
31
56
98
74
1
97
72
14,15
96
78
12,13,
75
55
9,16,209
95
103
3,203
50
7,207
11
70
99
80
6
2,202
100
104,111
23
101
49
73
102
8
107
106
10
52
43
33
79
21,108
57
114
81
82
24
58

Figure 1-9. AIR QUALITY STATIONS IN THE OHIO PORTION OF THE MCIAQCR (Past and Present)

Table 1-11. NAPCA SCHOOL STUDY
AIR MONITORING NETWORK

	Stations										
Pollutant	1	2	3	4	5	6	7	8	9	10	11
Suspended Particulates	X	X	X	X	X	X	X	X	X	X	X
Sulfur Dioxide											
Four Hour	X	X	X						X	X	X
24 Hour	X	X	X	X	X	X	X	X	X	X	X
Dustfall	X	X	X	X	X	X	X	X	X	X	X
Respirable Particulates	X	X	X	X	X	X	X	X	X	X	X
Soiling (four hours)	X	X	X						X	X	X

Table 1-12 presents a summary of air quality sampling at the stations shown in Figure 1-9. Most stations opérated only for the duration of programs that were conducted over a limited period of time. Several stations have been in more continuous operation, sometimes serving as base line stations for the temporary programs. In the main, these are run by the City of Cincinnati Division of Air Pollution Control and Heating Inspection, which also assists in operating the NASN and CAMP stations described above. Through a cooperative agreement with the National Air Pollution Control Administration (NAPCA), a special monitoring station (No. 107) is operated at the Waste Water Treatment Plant, where both air quality and meteorological parameters are observed.

1.7.2 Air Quality Data for Ohio

1.7.2.1 Particulates

The longest and most reliable record of air quality in the MCIAQCR is that for suspended particulates. Table 1-13 presents a summary of suspended particulate measurements made by high volume sampling at Station Nos. 98, 106, and 109. Although the record at Station No. 109 extends over 13 years, it is based on only 26 biweekly measurements per year, compared with measurements made every other day over a four=year period at the CAMP station, No. 106.

As shown in Figure 1-10, the 13-year record at the downtown Cincinnati Public Library site indicates a slight downward trend. A similar trend is suggested by the shorter record at the CAMP station. At both sites, annual arithmetic means are currently between 110 and 115 $\mu g/m^3$ and corresponding geometric means between 100 and 105 $\mu g/m^3$. These values are still over 50 percent higher than the Ohio Air Quality Standard of 65 $\mu g/m^3$ (geometric mean). Extrapolation of the trend will require many years before levels are reached that are in compliance with the standard. However, Station No. 98 (in the suburbs) is much closer to compliance.

Cumulative frequency distributions of particulate concentrations given in Table 1-13. These concentrations can be compared with Ohio's Air Quality Standards (Table 1-10). It is evident that concentrations at the urban sites have consistently exceeded standards throughout their entire period of operation.

Table 1-12. OPERATION OF AIR SAMPLING STATIONS, OHIO COUNTIES

Station Number	PARTICULATES Hi-Vol	PARTICULATES Dustfall	SULFUR DIOXIDE Bubbler	SULFUR DIOXIDE Continuous	SULFUR DIOXIDE Sulfation	Other	Period of Operation	By
1 to 11*	X	X	X			SO_2-4 hrs Soiling-4 hours	Oct.67 - Sep.68	City of Cincinnati
12-16,20,21, 23,25-37, 108		X					Feb.68- Apr.69	NAPCA
47-49, 70-94*	X	x X			X		Jul.69- Mar.70	Ohio APC Board
95,96,98* 99-104		X					1966----	City of Cincinnati APC
98**,	X		X				1964 ----	NASN:
109							1957-----	City of Cincinnati + NAPCA
106				X	NO, NO_2		1961-----	CAMP:
106	X				CO,Tox,THC		1966-----	City of Cincinnati + NAPCA
107	X					Wind: Speed & Direction	1966-----	Waste Water Treatment Plant(with NAPCA)

*See also listings marked by **.

Table 1-12. (continued)

Station Number	PARTICULATES Hi-Vol	PARTICULATES Dustfall	SULFUR DIOXIDE Bubbler	SULFUR DIOXIDE Continuous	SULFUR DIOXIDE Sulfation	Other	Period of Operation	By
**10	X							
**75								
**70		X						
**77								
**82		X						
111	X						Nov.69-Jan.70	Ohio APC Board
114	X							
202,204 207,209	X							
203	X							
245		X						

Table 1-13. OPERATION OF AIR SAMPLING STATIONS
OHIO COUNTIES

Station	Year	Percent Time ≤ Stated Value 10	30	50	70	90	Maximum	Mean	Geometric Standard Deviation	Arithmetic Mean
CINCINNATI										
Site 98	1967	39	63	76	89	136	151	74	1.54	81
OHIO	1968	37	64	84	102	135	193	78	1.67	87
	1969	45	56	68	85	120	145	69	1.55	71
Site 106	1966	79	106	135	167	228	333	134	1.47	144
OHIO	1967	71	95	114	139	189	301	114	1.48	123
	1968	57	82	102	127	204	462	103	1.58	115
	1969	61	86	104	134	183	288	104	1.56	116
Site 109	1957	83	107	132	157	197	237	127	1.36	133
OHIO	1958	94	115	130	144	214	319	137	1.39	145
	1959	83	104	123	166	206	336	131	1.54	143
	1960	64	117	136	151	214	316	136	1.45	145
	1961	70	96	117	139	173	189	110	1.39	116
	1962	68	96	115	127	254	294	117	1.56	130
	1963	82	94	130	137	180	204	116	1.36	121
	1964	93	115	137	165	301	331	145	1.48	157
	1965	85	117	137	160	207	255	133	1.44	141
	1966	77	108	141	178	271	399	138	1.60	154
	1967	68	77	120	146	184	225	111	1.49	119
	1968	49	77	96	138	183	227	99	1.64	110
	1969	52	80	100	125	171	385	100	1.60	112

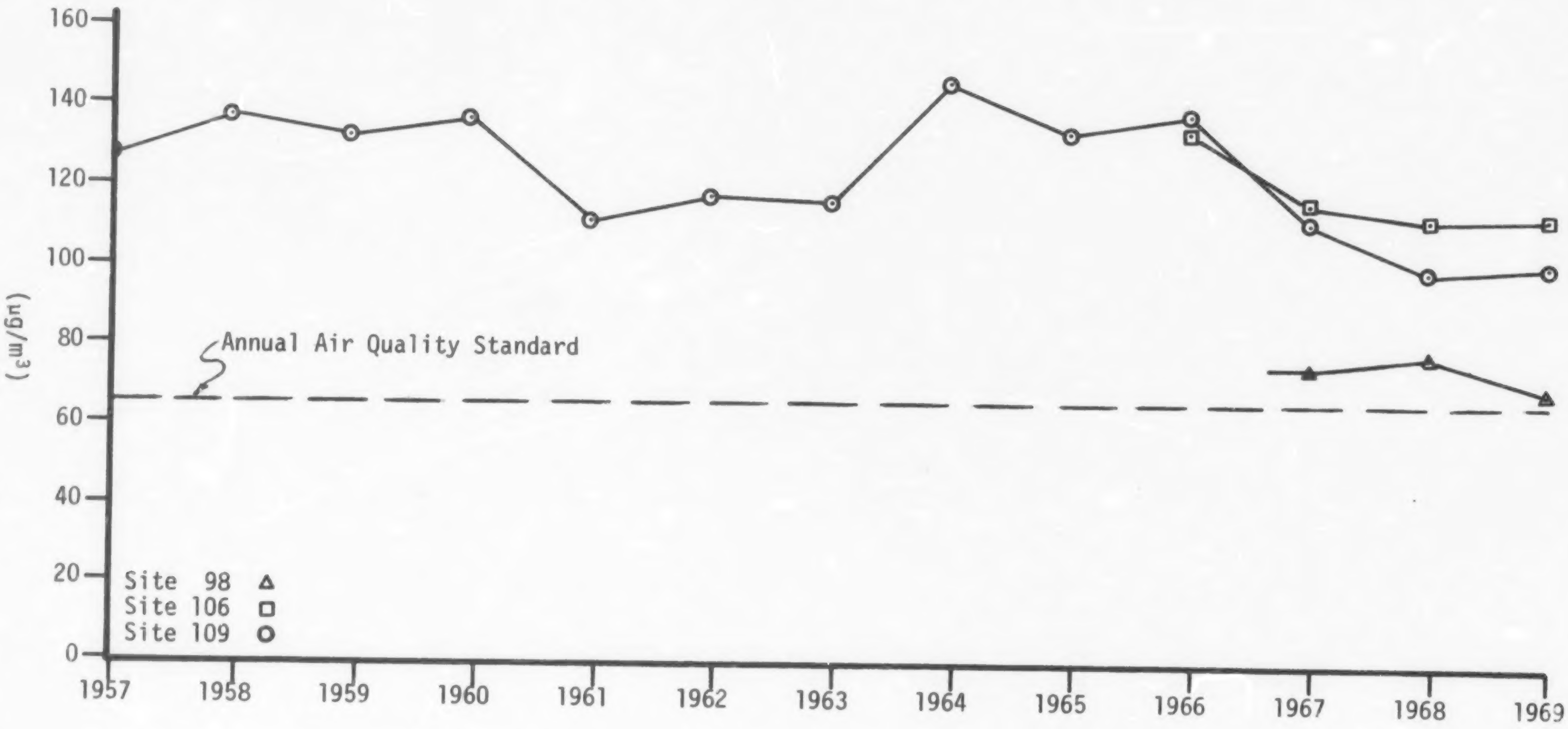


Figure 1-10. Annual Geometric Mean Concentrations of Suspended Particulate Measurements at Three Cincinnati Sampling Sites

Most of the data obtained during special projects may be useful for other studies as well. For example, Table 1-14 and 1-15, which are statistical summaries of data compiled for the school study, offer some insight into background concentrations for the MCIAQCR. Data obtained by the Ohio Air Pollution Control Board are particularly useful for showing the distribution of airborne particulates throughout the four-county area. However, none of the records from special projects is of sufficient length to show trends. A more permanent network of stations covering the four-county area is required in order that up-to-the-minute needs and effects of air pollution control action within the MCIAQCR can be determined.

1.7.2.2 Sulfur Dioxide

In contrast with the data on particulates, records on sulfur dioxide concentrations are limited. At only two sites, Station Nos. 106 (CAMP) and 109 (NASN) have data been compiled extending over several years. A cumulative frequency distribution of measurements at these stations during the year 1969 is presented in Table 1-16. Although both sites are but a short distance apart in downtown Cincinnati, the data shown in Table 1-16 are surprisingly close considering that measurements at the CAMP station are made on alternative days, while those at the NASN station, on alternative weeks. Note that the annual geometric means are well below the statewide standard of 43 $\mu g/m^3$ It may be for this reason that little attention seems to have been given to the measurement of sulfur dioxide compared with that accorded to particulates

Table 1-14.

CINCINNATI SCHOOL STUDY AEROMETRIC SURVEY
FREQUENCY DISTRIBUTION OF CONCENTRATION OF TOTAL SUSPENDED PARTICULATE MATTER
(24 HOUR AVERAGE VALUES)

OCTOBER 16, 1967 TO MAY 21, 1968
(CONCENTRATION IN MICROGRAMS/CUBIC METER)

	Number of Obser- vations	Minutes	Frequency Distribution - Percent								Maximum	Arith- metic Mean
			10	30	50	70	90	95	98	99		
Site 1 Roselawn	201	23	40	68	87	110	150	193	221	258	395	95
Site 2 Wyoming	188	18	32	58	80	98	143	160	191	201	242	84
Site 3 Garfield	204	19	36	65	88	118	164	198	217	245	291	97
Site 4 Carll	195	20	37	65	87	111	156	202	248	272	374	95
Site 5 Washington	204	27	61	92	117	147	216	268	356	385	572	133
Site 6 Hoffman	201	12	39	60	76	90	114	125	164	183	275	77
Site 7 McKinley	166	18	46	66	83	102	138	152	180	190	221	88
Site 8 Lincoln	180	25	44	59	73	84	112	130	146	154	191	75
Site 9 Madisonville	201	21	39	56	71	88	128	145	168	176	197	78
Site 10 Madeira	195	15	30	42	56	68	97	115	144	154	176	60
Site 11 Mariemont	199	22	42	60	78	100	138	165	195	201	241	84

Table 1-15.

CINCINNATI SCHOOL STUDY AEROMETRIC SURVEY
TOTAL SUSPENDED PARTICULATE ($\mu g/m^3$)
DAILY MEASUREMENTS TAKEN FROM OCTOBER 16, 1967 - MAY 21, 1968

School	Geometric Mean	Standard Geometric Deviation	84% Below	95% Confidence Interval Lower Limit	Upper Limit
Roselawn	84.4	1.66	140.1	78.6	90.5
Wyoming	73.9	1.73	127.9	68.3	80.0
Garfield	84.2	1.74	146.9	78.0	90.0
Carll	83.2	1.72	143.2	77.1	89.9
Washington	117.1	1.65	193.6	109.2	125.5
Hoffman	70.8	1.58	111.9	66.4	75.4
McKinley	80.0	1.59	127.0	74.5	85.9
Lincoln	70.7	1.47	103.8	66.8	74.8
Madisonville	70.9	1.57	111.3	66.6	75.5
Madeira	54.5	1.59	86.7	51.0	58.1
Mariemont	76.2	1.60	122.3	71.4	81.5

Table 1-16. Summary of Sulfur Dioxide Measurements at Ohio Sites Within the MCIAQCR (Concentrations in Micrograms per Cubic Meter)

Site	Period	Minimum	10	30	50	70	90	Maximum	Geometric		Arithmetic Mean
									Mean	Standard Deviation	
106	1969	7	10	17	21	43	61	73	23	2.02	30
109	1969	7	8	15	19	29	57	116	21	2.09	26

2.0 CONTROL PLAN

An Emission Control Strategy is made up of a set of compatible emission standards. Each standard applies to emissions from a specific type of operation (e.g., fuel combustion, industrial process, solid waste disposal),and the summation of the several standards included within each strategy defines allowable emission levels from each source in the region. In an air quality control region made up of several political jurisdictions (states, counties, or cities), each set may apply to a specific political jurisdiction within the region. Separate emission control strategies are defined for each pollutant.

2.1 DESCRIPTION OF THE SIMULATION MODEL

The simulation model used for strategy evaluation was the Implementation Planning Program developed by TRW Systems Group under contract with the National Air Pollution Control Administration, U. S. Department of Health, Education and Welfare. This program uses three computer models to perform an analytic evaluation of each proposed control strategy.

2.1.1 Atmospheric Diffusion Model

This model, operating on a data base consisting of a regional source emission inventory and annual average meteorological data, produces expected ground level pollutant concentrations on an annual arithmetic average basis. Expected ground level concentrations are calculated at a large number (200-250) of receptor sites throughout the region. Isopleth maps and other visual displays of projected air quality are produced to aid in regional evaluations. Existing air quality measurements are used to verify the predicted concentration values so that further extrapolations and projections can be made with some assurance (see Section 2.3). The atmospheric diffusion model provides the key link between pollutant emissions and ambient air quality necessary to make informed decisions relating to proposed emission regulations. The diffusion model, by providing a set of factors relating each emission source to receptor points throughout the air quality control region, allows the effect of various degrees of emission reduction to be examined in terms of expected ambient pollutant concentrations.

2.1.2 Control Cost Model

A complete evaluation of an air pollution control strategy should include consideration of the various control techniques and measures which would be required by the emission reduction plan. This can be accomplished by an examination of all the control alternatives available to each source within the region. This examination should include not only the control efficiencies expected from the various control measures but also an estimate of the cost of each measure. Only with such information developed on the basis of available control technology can a judgment be made concerning the feasibility and cost of various emission reduction plans. The Control Cost Model prepares a listing of applicable control techniques for each pollution source identified in the regional emission inventory. This listing defines the types of available devices or control measures and estimates the control efficiency and cost of each. The data generated by this model is utilized in the subsequent control strategy evaluation section of the program.

2.1.3 Control Strategies Model

This model operates upon information produced by the two computer models described above to provide summary compilations relating to the regional effects of various control strategies. Control strategies consist of a set of compatible emission standards covering all political jurisdictions and source types included in the air quality control region. Emission standards, the basic building blocks of control strategy, generally specify maximum emission levels of a particular pollutant for certain source types. A combination of emission standards covering all the sources of a pollutant is thus an emission control strategy. By applying the emission reductions which would be required under each strategy to the atmospheric diffusion model described above, it is possible to estimate the ambient air quality levels which would result. Also, the overall cost to the region of bringing each source into compliance with the various emission standards is estimated. The degree to which current control technology is able to supply the required emission reductions is available for review. The Control Strategies Model is capable of simulating a variety of control alternatives available to regional control officials and provides them information with which to judge the relative merits of each. Regional growth predictions and other factors can also be analyzed with the model.

The overall computer simulation program thus provides the user with the type of data on which an informed judgment concerning air quality control regulations may be based.

2.2 RATIONALE FOR SELECTION OF OPTIMAL STRATEGY

Several criteria are available with which to measure the desirability of any control strategy. The use of the computer simulation modeling technique aids control strategy selection by providing detailed technical estimates of the regional effects of various alternative strategies. The following is a list of the criteria used in selecting the optimum control strategy in this Implementation Plan, together with a brief description of how these criteria are compiled.

2.2.1 Compatibility with Air Quality Standards

Air quality standards for particulate and sulfur dioxide pollutants have been adopted by the three states making up the MCIAQCR. The primary purpose of emission control regulations is to bring ambient pollutant levels into compliance. By simulation modeling of the emission reductions required, a control strategy can be evaluated with atmospheric diffusion calculations. The process leads to rejection of those strategies under which emission levels remain too high to allow achievement of the desired air quality.

2.2.2 Regional Cost

After one or more strategies have been found which will permit attainment of air quality standards, the total cost of implementing these emission standards must be considered. As was mentioned in Section 2.1, the simulation model being used provides an estimate of cost based on available control technologies. If two control strategies promise nearly equal ambient air quality, then the less costly of the two would be the most desirable. In addition to the overall cost of implementing a particular control strategy, some source categories may experience greatly different control requirements under different strategies. The computer simulation output enables examination of this phenomenon with respect to important source categories.

2.2.3 Enforceability

Certain types of emission standards may be easier for a control agency to administer and enforce than others; even though equivalent pollutant reductions are required. Field experience gained in actual control agency operations is invaluable in making an evaluation of this factor. The control agency resource requirements may well be influenced by the type of emission standards ultimately adopted.

2.2.4 Summary

Each of the alternate strategies was evaluated according to the above criteria and the optimum set of emission standards was selected. These emission standards were used in formatting the proposed control regulations (Section 4.2).

2.3 MODEL VERIFICATION

The use of measured ambient pollutant data is an essential step in the simulation process. The model verification or validation compares model estimates of pollutant concentration with actual measured values. Several potential errors in the atmospheric transport and diffusion calculations may be examined and systematically accounted for by this procedure.

a) The pollutant emission inventory can be examined for consistency with air quality measurements. Errors or omissions in the inventory are often detected at this stage and may be corrected before continuing with the strategy simulation exercise.

b) Topographic conditions peculiar to the air quality region may be evaluated. While the diffusion model does not explicitly consider terrain features, their effect on air quality may be accounted for by the verification process.

The basic results generated by the model verification are a statistical regression line relating measured to calculated ground level concentrations and a correlation coefficient. Based on the correlation coefficient and the number of measurement stations, it is possible to make a statistical estimate regarding the validity of the model predictions compared with actual air quality measurement. A high correlation coefficient (close to unity) indicates that the diffusion model results correctly indicate the trend in pollutant concentrations as measured in the region.

The regression line relating predicted to measured pollutant concentrations is used to correct the model estimates. The two parameters of the linear regression each have a particular meaning and interpretation in the diffusion model verification.

y-Intercept - The regression line may be visualized by plotting measured versus calculated concentrations on the x and y axis, respectively, of a scatter plot diagram (See figures 2-2 and 2-5). The y intercept, y_o, is the minimum value that may be predicted using the regression line to relate calculated to measured concentrations. In this sense, y_o may be considered a background concentration.

Slope - The slope of the regression line indicates the amount of increase observed in the measured concentrations (or in the concentration predicted using the regression line) due to a given increase in that calculated by the diffusion model.

The air quality data available for model verification in the MCIAQCR consisted of the results of measurements made throughout the region during the months of November and December 1969, and January 1970. The use of seasonal air quality data as a basis for verifying a model designed basically to predict average annual concentration values is open to question. Indeed the results described in this section show that for the MCIAQCR it was not possible to develop a useful model verification from the winter period for sulfur dioxide.

In addition to the air quality data, several other types of information were used during the model verification exercise. Meteorological data used were the average winter mixing height as measured at the Dayton (Ohio) Airport, and the wind direction and speed data for the three month period collected at the Cincinnati Airport located in Covington, Kentucky. The same sources of meteorlogical data were used in making the annual concentration estimates based on the atmospheric diffusion model. In this case, however, averages taken over five years were used rather than a specific annual period. (See Appendix A for meteorological data.)

No specific effort was made to account for the topographic features of the region in the model verification procedure.

2.3.1 Suspended Particulates

Diffusion model verification for suspended particulates used air quality measurements made by the 24 hour high volume filter technique. The location of these stations is displayed in Figure 2-1. These stations adequately cover the geographical area of the MCIAQCR. A number of model verification runs were made based on the data collected from these stations. During the initial runs, a number of errors in both the original emission inventory and in the air quality data were detected. The errors were corrected and a final verification run was made.

Figure 2-2 displays the results of this computation. This figure shows the measured air quality data plotted against the model calculations for the same location based on the emission inventory and meteorological data. The line shown is the regression line calculated on the basis of the data. The regression is highly significant in a statictical sense (less than a 1% probability that no correlation exists). The background, y_o, value of 36 $\mu g/m^3$ is also regarded as acceptable, i.e., it represents a reasonable approximation of background levels of suspended particulates, or the irreducible level due to uncontrollable sources.

The results of using the regression line resulting from this verification to project average annual concentrations are shown in Figure 2-3. Available average annual measured concentrations (also shown) correlated well with the model estimates. Figure 2-3 indicates that the use of seasonal data (winter) for air quality measurements, meteorological and emission data appeared fairly effective in the case of particulates.

Measurements of ambient concentrations of suspended particulate pollutants have been made at various locations in the MCIAQCR since 1957. For the most part, the sampling sites were located in or near the City of Cincinnati and were operated for periods of one year or less. As a result, there is a paucity of data for the Region as a whole. There are four locations (three in Cincinnati and one in Covington) where data are available for the year 1969. These four stations include three which are a part of the National Air Sampling Network and the CAMP station. The annual (1969) geometric mean concentrations at these stations are shown on a map of the Region (Figure 2-3). Included on the map are the geometric mean concentrations for the stations in the Northern Kentucky Air Monitoring Network (July 1968 to April 1969) and the Cincinnati

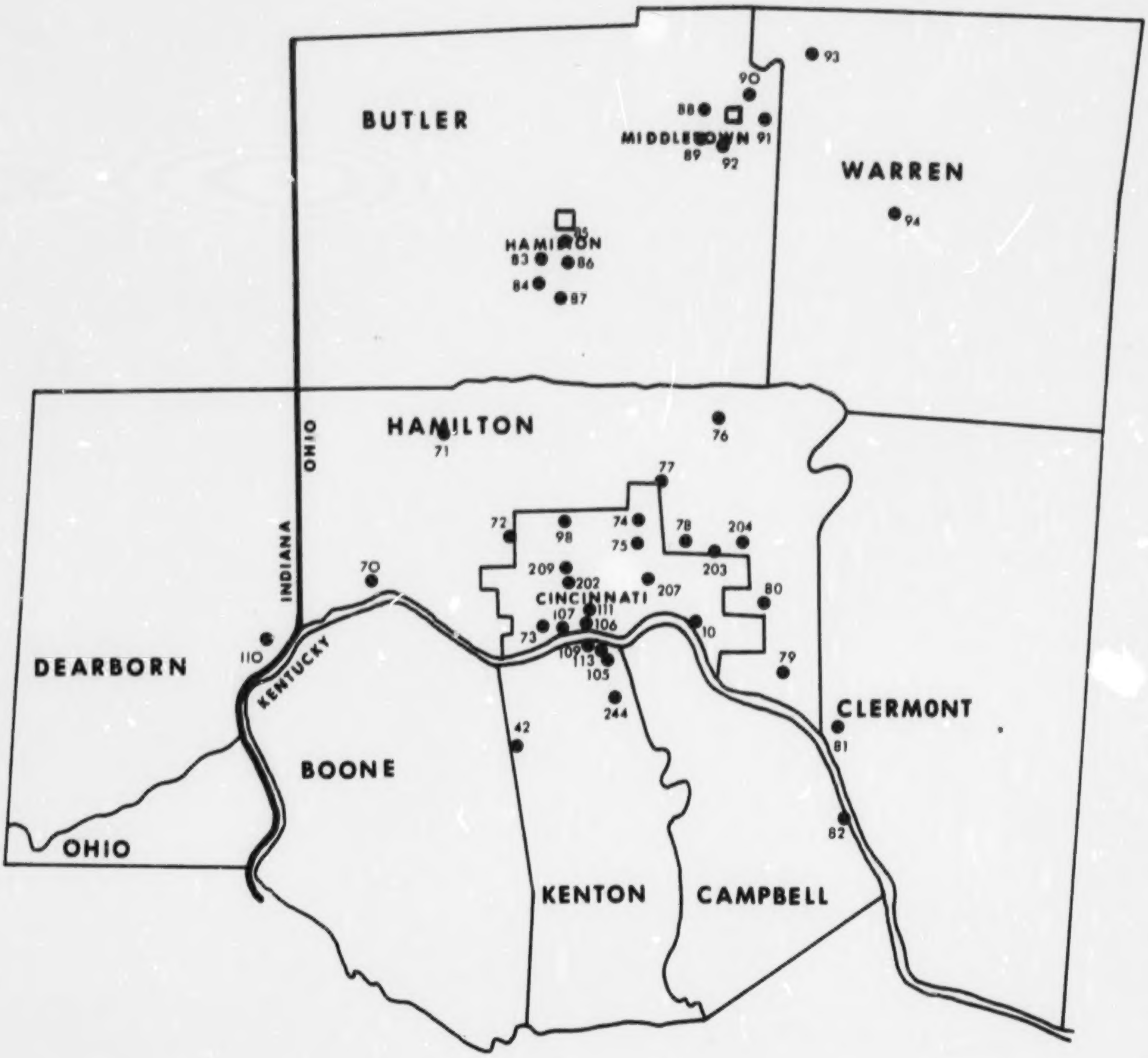

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Figure 2-1. Particulate Measuring Stations
Used in Model Verification

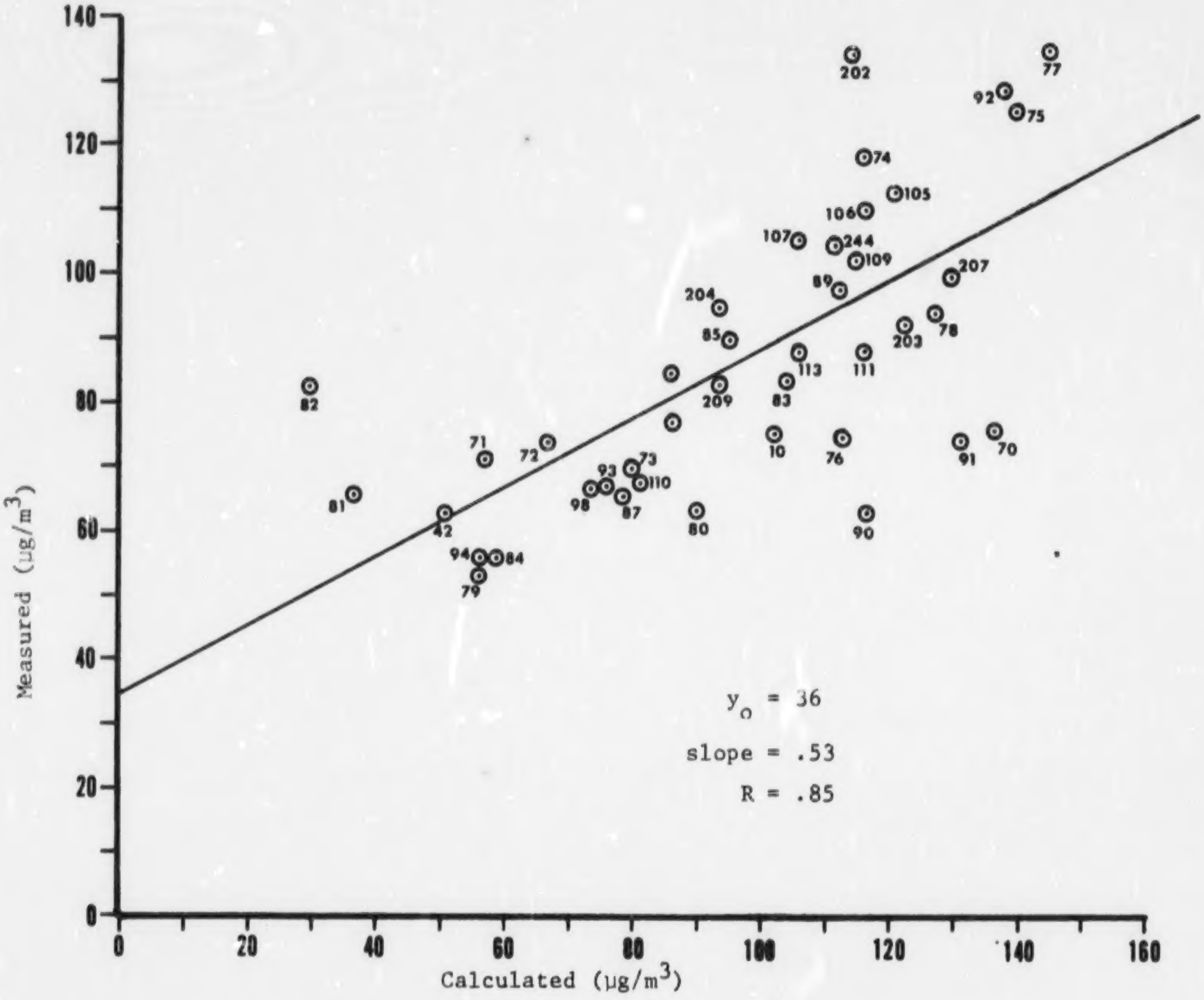
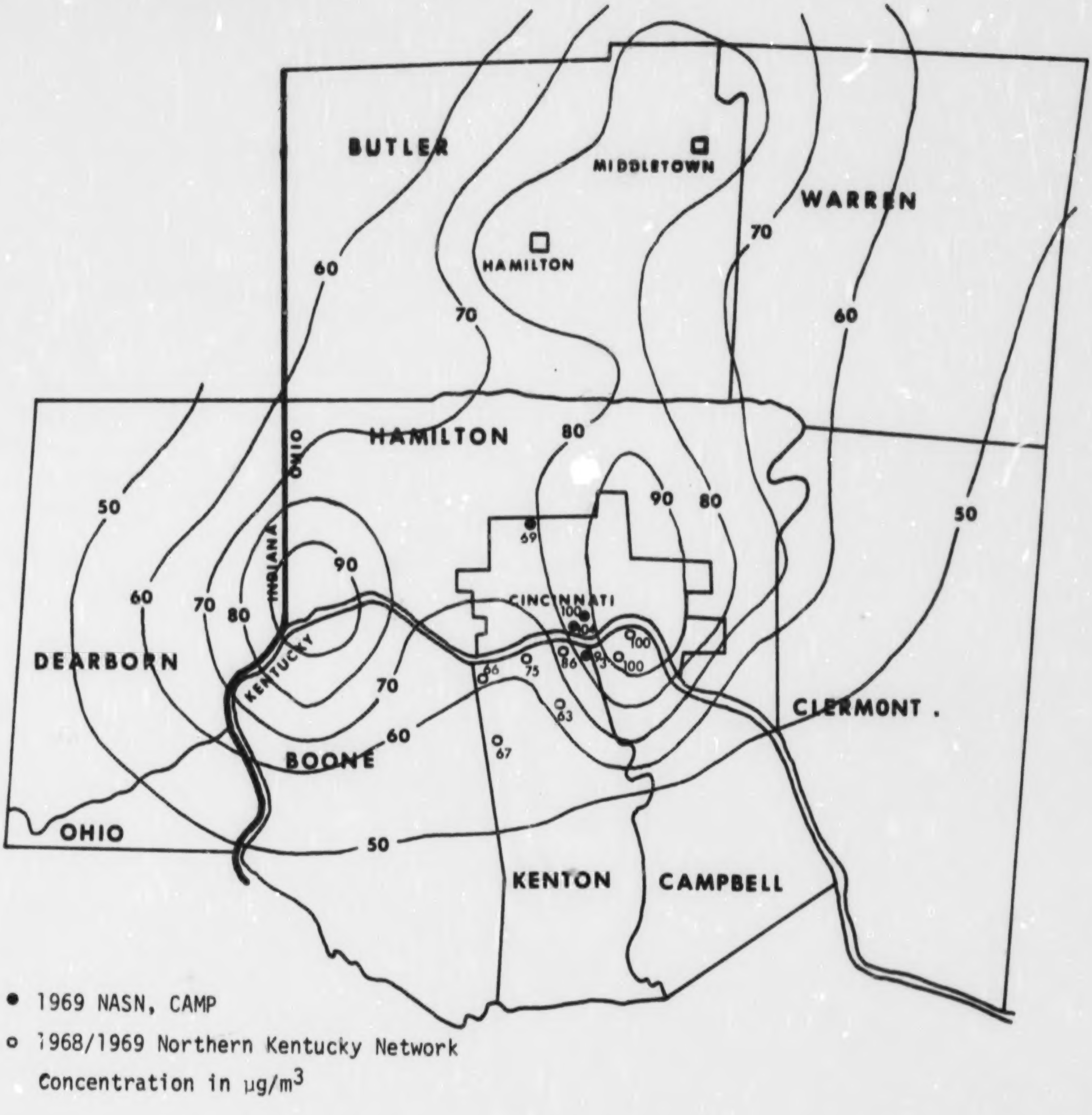


Figure 2-2. Particulate Diffusion Model Verification (Winter Data - November 1969 - January 1970)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KENTON
CAMPBELL
50
60
70
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69
100
75
86
66
63
67
● 1969 NASN, CAMP
○ 1968/1969 Northern Kentucky Network
Concentration in μg/m3

Figure 2-3. ANNUAL GEOMETRIC MEAN CONCENTRATIONS OF SUSPENDED PARTICULATE POLLUTANTS AS MEASURED AT SELECTED SAMPLING STATIONS AND ANNUAL ARITHMETIC MEAN CONCENTRATIONS AS ESTIMATED BY DIFFUSION MODEL

School Study (October 1967 to May 1968).

In order to illustrate the geographical distribution of particulate pollutants for the entire MCIAQCR, the measurement data must be supplemented by estimates of concentration from the diffusion model. The isopleths shown on Figure 2-3 represent annual arithmetic mean concentrations as determined by the model using the 1969 emission inventory and climatological data for the period 1965-1969. (See Section 2.1 for discussion of model.)

There is an inconsistency in Figure 2-3 in that the measurement data are presented as geometric means and the diffusion model estimates are presented as arithmetic means. This inconsistency stems from the fact that the annual air quality standards are expressed in terms of geometric means (65 $\mu g/m^3$ for Kentucky and Ohio, 75 $\mu g/m^3$ for Indiana) and the Martin-Tikvart diffusion model provides only annual arithmetic mean concentrations. For comparative purposes, the arithmetic means can be reduced by 10-15 percent to obtain geometric means.

From Figure 2-3 it is apparent that there are large areas within the MCIAQCR where the air quality standards for particulate pollutants are being exceeded. Areas of high pollution are centered on Cincinnati and Newport, Kentucky, the City of Hamilton and the vicinity of the Ohio and Indiana border near the Ohio River.

This verified diffusion model was used to test various alternative control strategies (Section 2.4).

2.3.2 Sulfur Oxides

Considerably more difficulty was experienced in obtaining a satisfactory model verification for sulfur oxides. Problems relating to data incompatibility with the diffusion model caused the simulation technique to be abandoned for this pollutant.

Initial air quality data were available from fourteen measurement sites for the three month winter period (November 1969 through January 1970). Three measurement techniques were used; West-Gaeke analysis employing liquid impinger samplers, continuous conductimetric measurements, and continuous colorimetric measurements. A satisfactory relationship could not be developed between the different sampling and analytic techniques used and it was necessary to restrict the model validation exercise to a single measurement type. At one station, number 106, both West-Gaeke and continuous colorimetric measurements were made during the three month study period. The results show that colorimetric measurements gave average readings 50µg/m^3 higher than the West-Gaeke technique during the three month period. Since the West-Gaeke method is widely regarded as the standard method only these measurements were used in the model verification procedures.

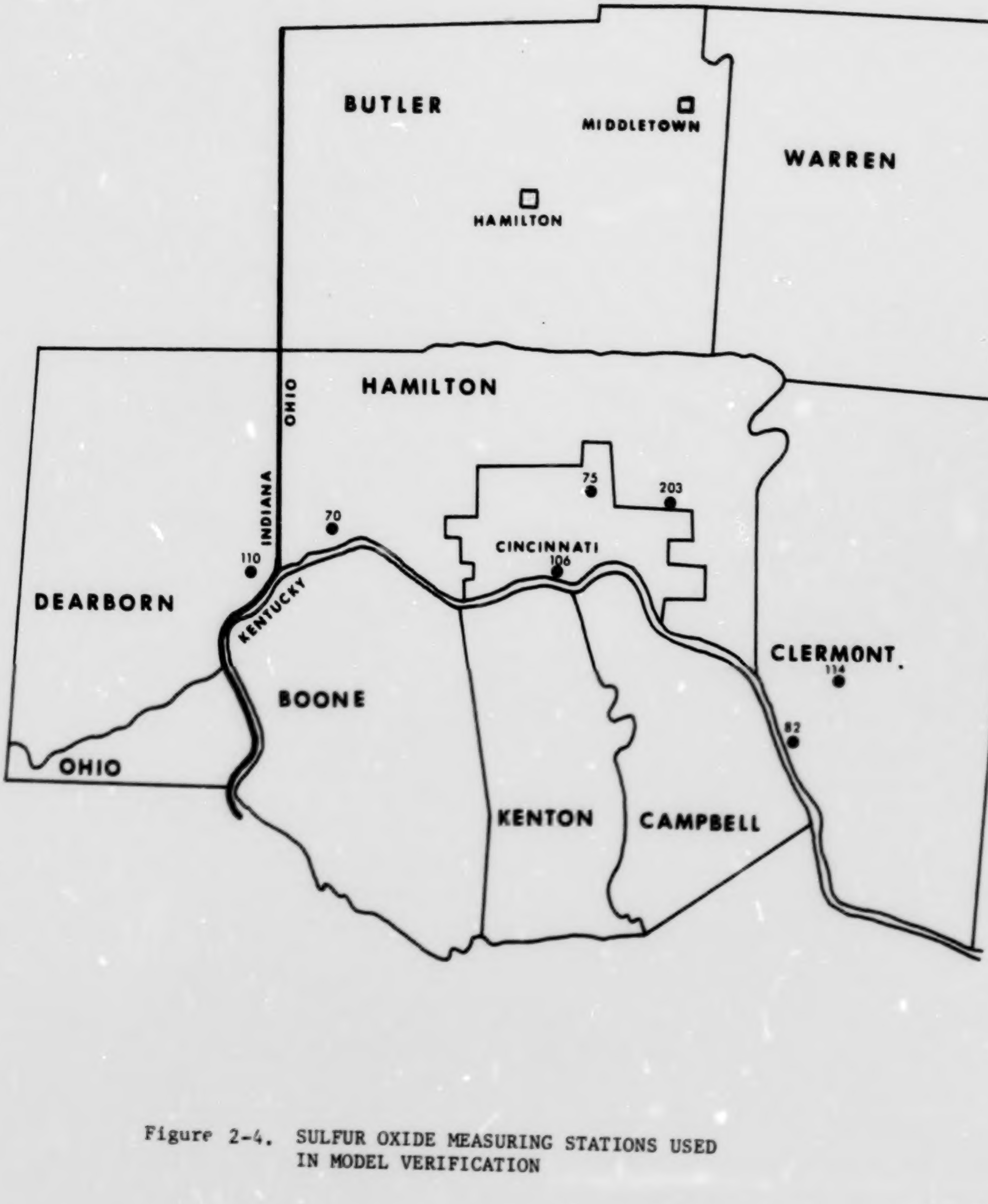
Other sampling stations were not used because insufficient samples were taken to provide a representative average of the sampling period. The result of these restrictions was to reduce the number of air quality measuring sites available for verification to seven and to reduce the geographical coverage of the region.

Figure 2-4 shows the locations and identification numbers of the sampling stations used in the model validation. The relationship between measured and calculated sulfur dioxide concentrations at these sites is shown in Figure 2-5. The regression line and its coefficients are also displayed in this figure. This represents the best model verification which could be obtained for the winter season based on the air quality data and emission inventory available.

It was recognized that any acceptable verification of the model must be applicable to annual as well as winter conditions before the simulation of control strategies could be accomplished. An attempt was made to use annual average sulfation plate data to verify the diffusion model. This was unsuccessful because the sulfation data did not record a wide enough range of air quality to yield a regression line slope that was significant in either a statistical or practical sense.

Annual average pollutant concentrations were calculated for the MCIAQCR based on the model verification presented in Figure 2-5. These concentrations are presented in Figure 2-6.

The ambient air monitoring data for sulfur dioxide are more scarce, both on a regiowide basis and locally, than was the case for particulates. Presentation of regional air quality must necessarily depend on measurements gathered at relatively few stations. Some localized and short-term measurements specific to this state are presented in Section 1.


BUTLER
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CINCINNATI
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DEARBORN
KENTUCKY
CLERMONT
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BOONE
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OHIO
KENTON
CAMPBELL

Figure 2-4. SULFUR OXIDE MEASURING STATIONS USED IN MODEL VERIFICATION

B

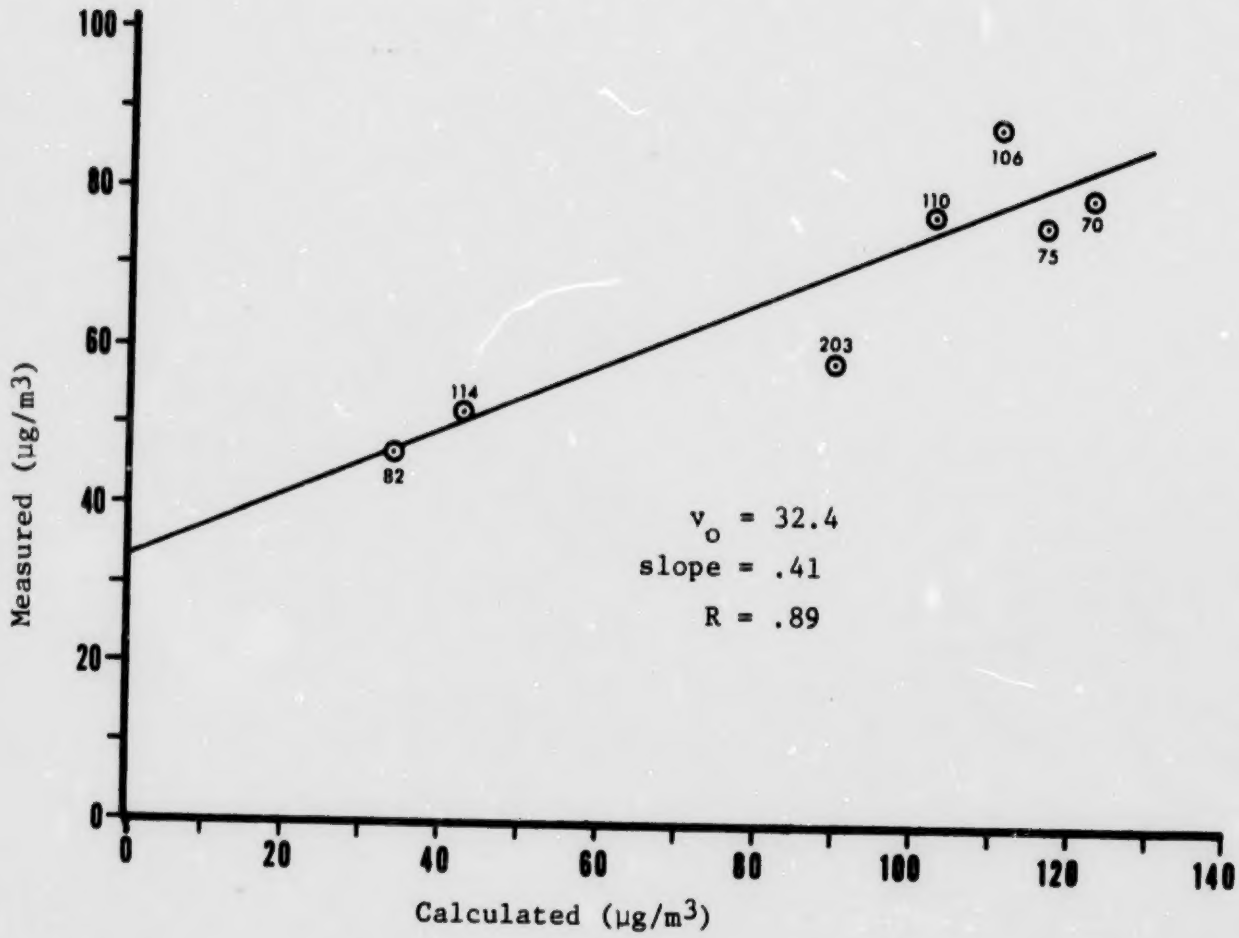
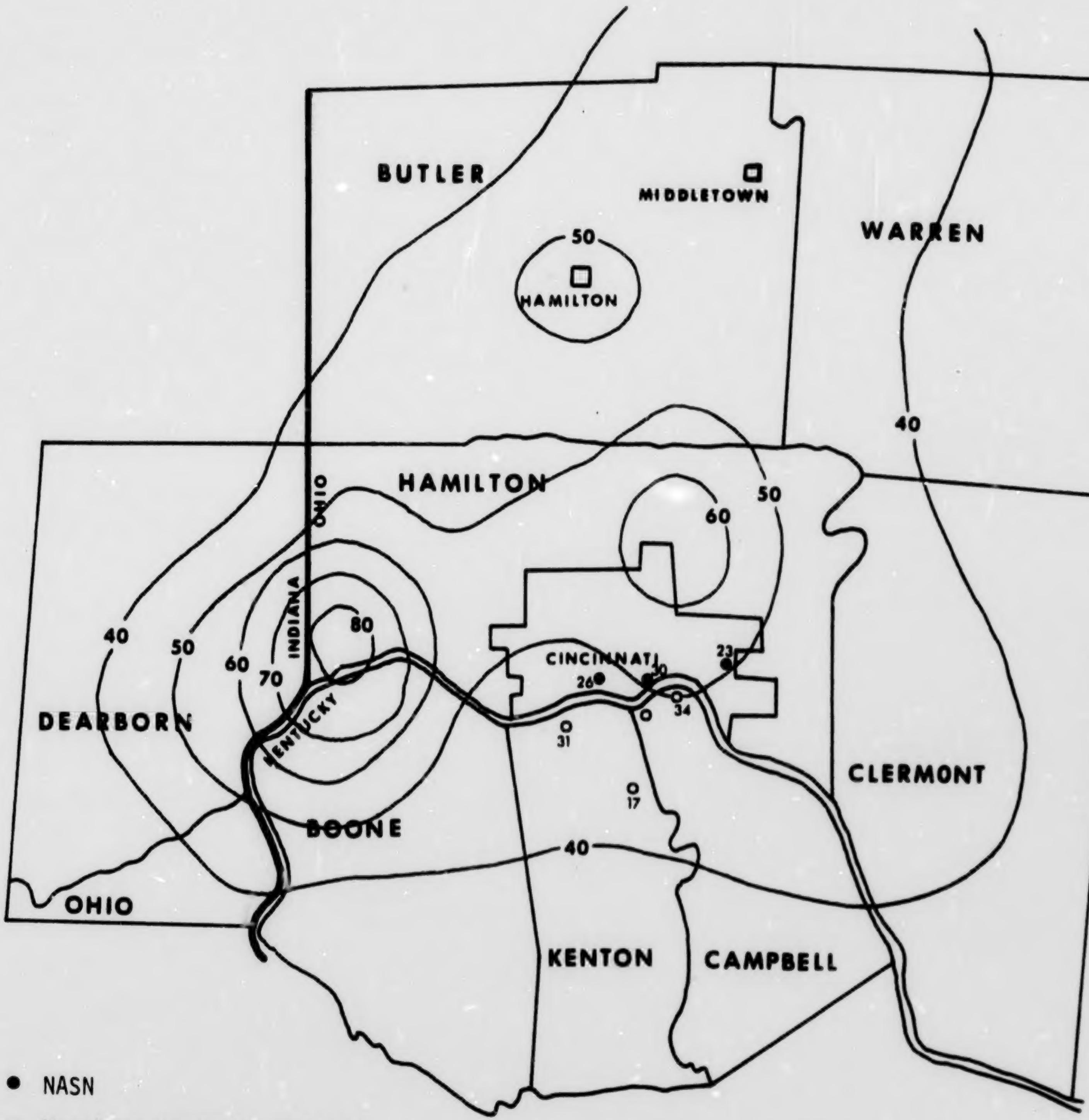


Figure 2-5. WINTER SULFUR OXIDES MODEL VERIFICATION (November 1969 - January 1970)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CINCINNATI
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34
31
DEARBORN
KENTUCKY
CLERMONT
17
BOONE
40
OHIO
KENTON
CAMPBELL

● NASN

○ Northern Kentucky Network

Concentration in $\mu g/m^3$

Figure 2-6. ANNUAL MEAN CONCENTRATION OF SULFUR OXIDE AS MEASURED AT SELECTED SAMPLING STATIONS AND ANNUAL ARITHMETIC MEAN CONCENTRATIONS AS ESTIMATED BY DIFFUSION MODEL

Figure 2-6 shows the available annual average sulfur dioxide measurements taken in the MCIAQCR during 1968-1969. The Northern Kentucky Network was operated from August 1968 through April 1969. The National Air Sampling Network (NASN) sites shown represent averages for the calendar year 1969. Also shown in Figure 2-6 are the annual average isopleths predicted by the computerized atmospheric diffusion model. (See Sections 2.2 and 2.3). It should be noted that the concentration values show as model predictions (isopleths) and those from NASN stations are presented as annual arithmetic means. Kentucky's sampling results are displayed on an annual geometric mean since the adopted Air Quality Standard in that state is in terms of a geometric mean. Comparison can be made between the two sets of values by increasing the Kentucky values by about 20%.

It is obvious from an examination of Figure 2-6 that the model predictions and measured air quality data are not in agreement. The model appears to be over-predicting by a factor of approximately two in the area of the sampling stations. This indicates that the verification developed for the diffusion model during the winter season is not applicable when projected to annual average conditions. Unfortunately, the annual data presented in this section was found to be inadequate for model verification because of lack of range in sampled values and the lack of proper geographical coverage. The results presented in Figure 2-6 are discussed further in Sections 2.3.2 and 2.4.3.

It was apparent from the comparison of verified model estimates and annual average measurements (by the West-Gaeke technique) that the winter verification which had been done did not accurately reflect the annual average sulfur dioxide concentrations in the MCIAQCR. Since it was impossible to verify the model on an annual basis it was decided to abandon the computer simulation technique for the evaluation of sulfur oxide control strategies.

2.4 CONTROL STRATEGY SELECTION

2.4.1 Particulate Control Strategies

A total of 18 particulate control strategies was tested in the simulation exercise. Each of these strategies specifies an allowable emission level for each type of source within the region (e.g., fuel combustion, industrial process and solid waste disposal).

1. Existing Control Regulations Through the Region

   This strategy displayed the air quality resulting from complete compliance with existing control regulations in the MCIAQCR. Figure 2-7 shows existing fuel combustion standards. Table 2-1 indicates existing standards for industrial processes and describes existing solid waste disposal standards.

2. Most Stringent Existing Regulations Applied Through Region

   Emission standards for fuel combustion, industrial processes, and solid waste disposal were taken from the existing regulations of Kentucky, Indiana, and Cincinnati, respectively.

3. Most Stringent Existing Fuel Combustion, Second-Most Stringent Industrial Process Regulation

   Emission standards for fuel combustion, industrial processes, and solid waste disposal were taken from the regulations of Kentucky, Indiana, and Cincinnati.

4. Most Stringent Industrial Process Regulation, Second-Most Stringent on Fuel Combustion

   Industrial process and solid waste disposal standard as for Strategy 2, with Cincinnati's fuel combustion control standard.

5. Cincinnati Particulate Regulations Applied Throughout the Region

6. Maximum Technology Control

   This strategy allows fuel combustion sources to switch to natural gas and eliminates all incineration. Industrial process sources are controlled with the most effective control device, usually in fabric filter or efficient electrostatic precipitation.

7. Maximum Technology Control without Fuel Switching

   This strategy allows fuel combustion control with the best

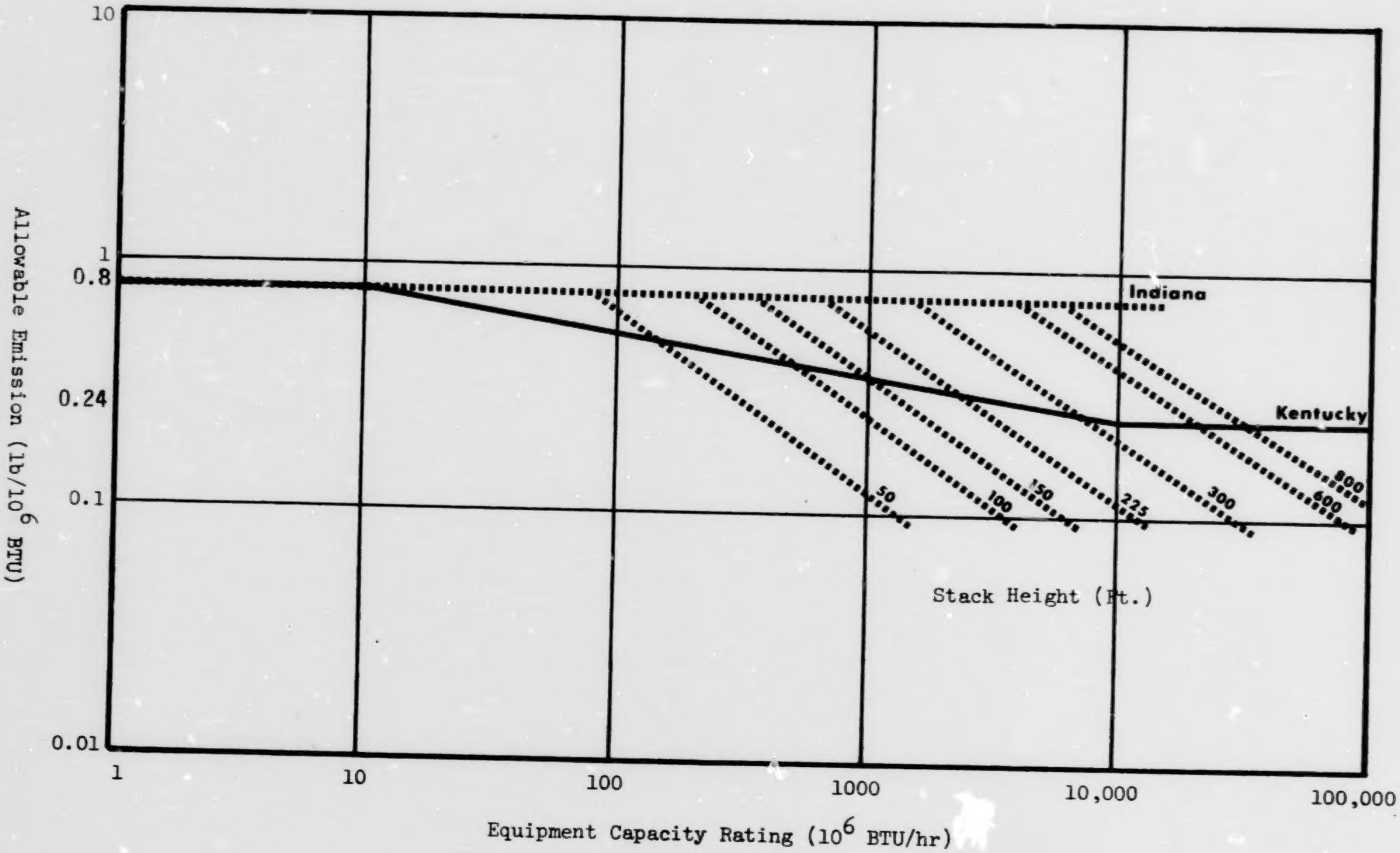


Figure 2-7. Existing Emission Standards in the MCIAQCR Based on Input Heat Capacity

Table 2 - 1(A) Existing Particulate Emission Standard for Industrial Process Sources (City of Cincinnati Regulation)

Effective Height of Process Vent, ft[a]	Allowable Emissions lb/hr[a]
Up to 50	4
75	10
100	17
125	27
150	40
175	53
200	68
225	88
250	110
275	130
300	160

(a) Allowable Emissions for intermediate heights shall be determined by linear interpolation.

(B) Standard for particulate emissions from incinerators: 0.4 pounds of particulate matter per 1000 pounds of discharged gases adjusted to 12 percent CO_2. (City of Cincinnati) available control device applied. Other sources are controlled as in strategy number 6 above.

8. Maximum Technology Control with Fuel Switching, Solid Waste Disposal Control To Level of Existing Cincinnati Standard

9. Most Stringent Existing Regulations, Maximum Technology Without Fuel Switching

   Industrial processes and solid waste disposal are controlled to same level as in Strategy 1.

10. Most Stringent Set of Control Standards, Not Maximum Technology

    Stringent heat input curve for fuel combustion sources (Figure 2-8A) process weight curve for industrial processes (Figure 2-9A) and 0.05 grains/scf allowable emissions for incinerators.

11. Same As Strategy 10 with Relaxation of Solid Waste Disposal Standard

    Incinerator emission must be controlled to 0.2 grains/scf.

12. Same as Strategy 10 with Process Weight Standard for Industrial Process Emissions as Shown in Figure 2-9B

13. Same as Strategy 11 with Process Weight Standard (Figure 2-9B

14. Same as Strategy 10 with Heat Input Standard for Fuel Combustion Sources as Shown in Figure 2-8B

15. Same as Strategy 11 with Standard for Fuel Combustion (Figure 2-8B)

16. Same as Strategy 12 with Standard for Fuel Combustion (Figure 2-8B)

17. Same as Strategy 13 with Standard for Fuel Combustion (Figure 2-8B)

18. Potential Emission Standard

    This standard relates the allowable emissions for each source to its uncontrolled or potential emissions. Standard is applied to all source categories and is displayed in Figure 2-10.

This set of strategies represents a blend of control standards existing in the Region, theoretical maximum control levels, and control standards developed and used in other parts of the country. Simulation of

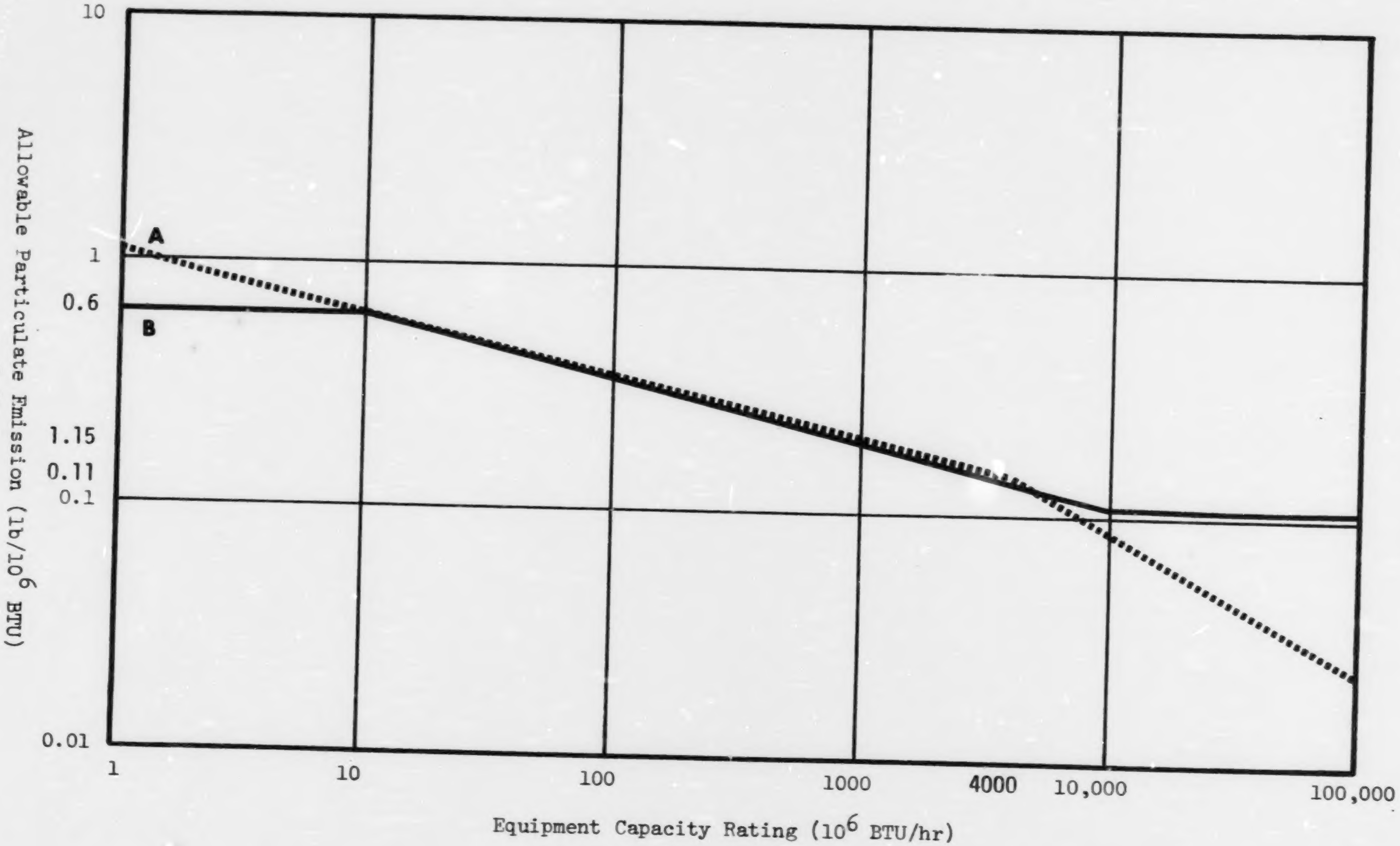


Figure 2-8. Additional Heat Input Type Standards Tested in Proposed MCIAQCR Particulate Control Strategies.

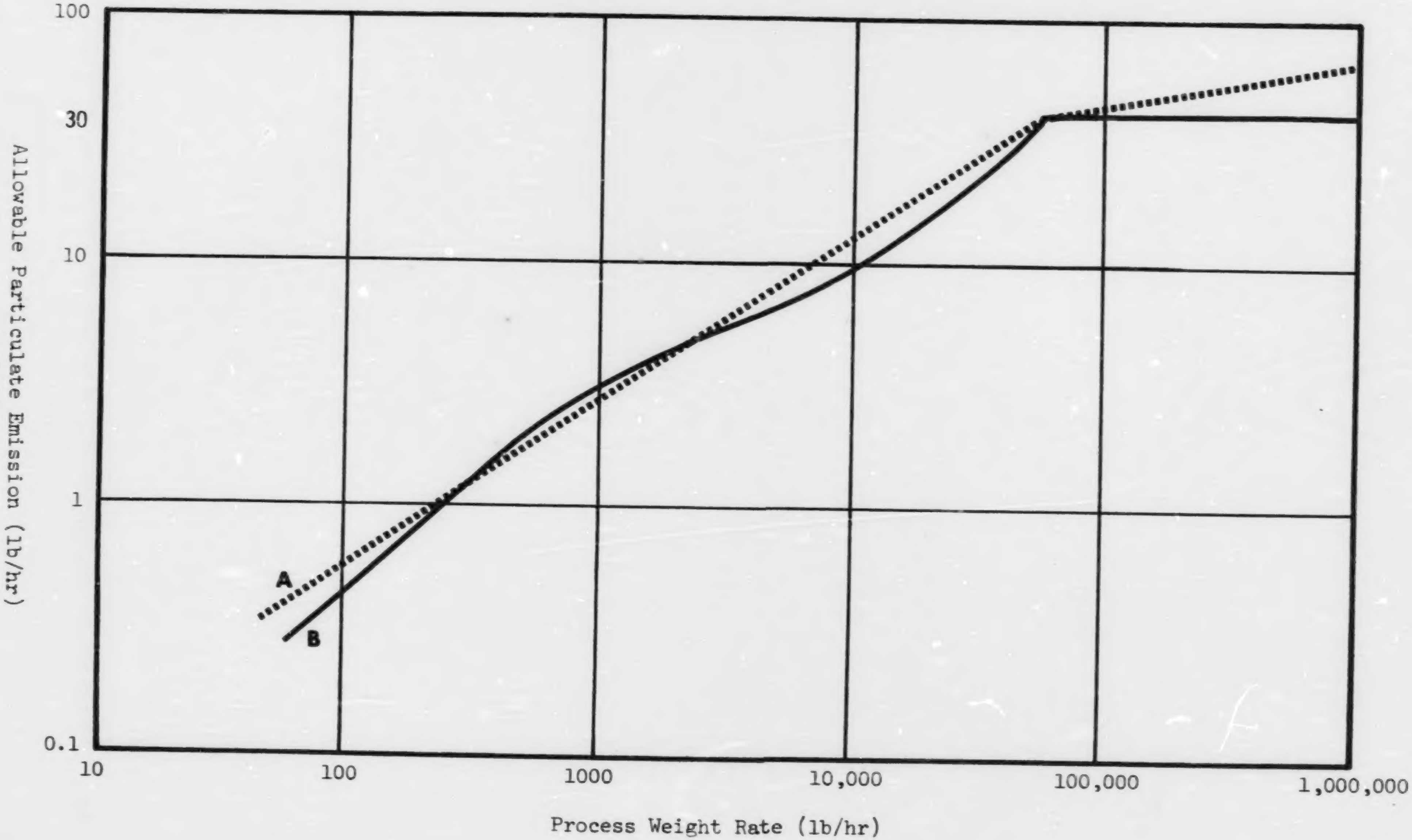
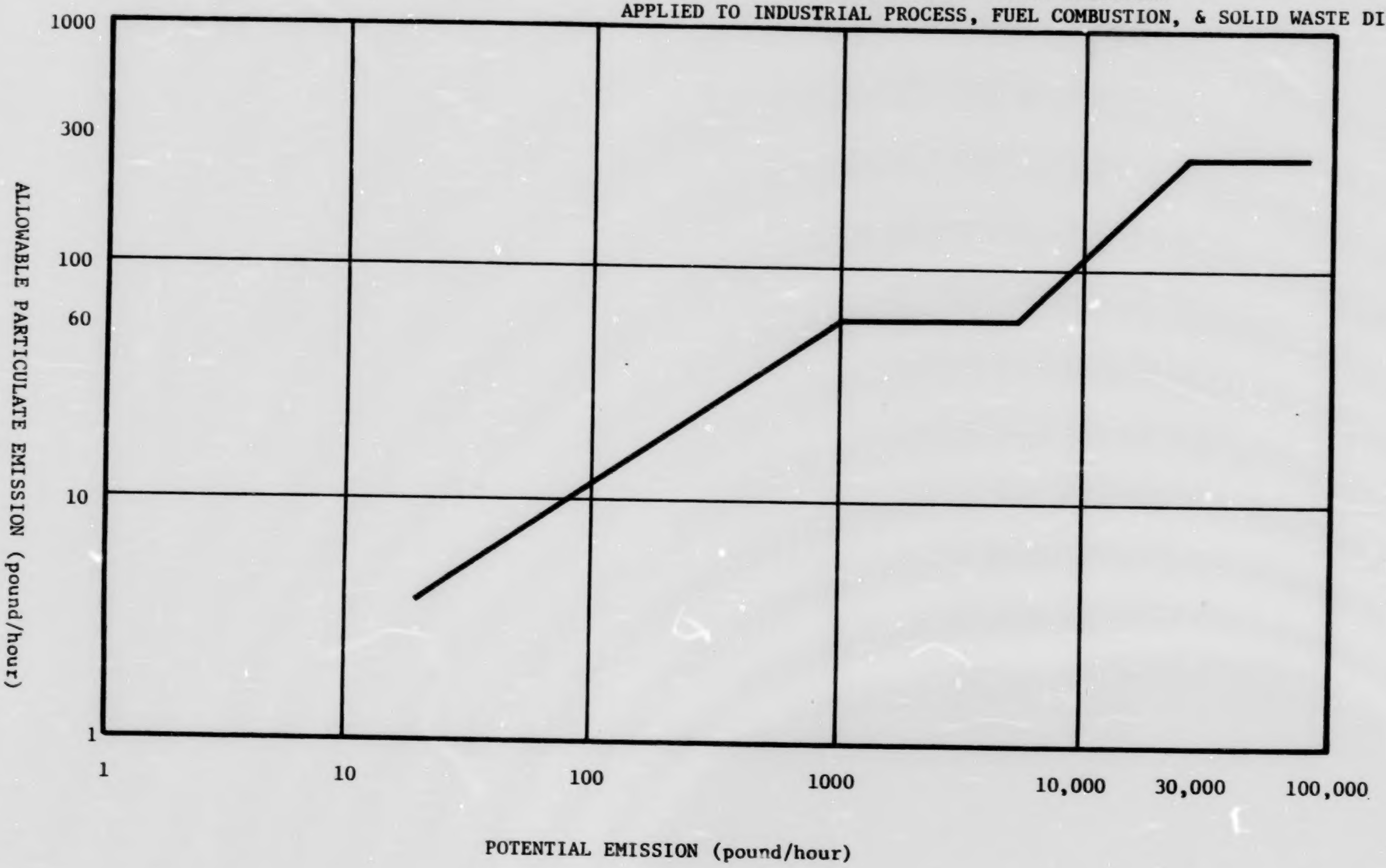


Figure 2-9. Two Sets of Emission Standard Curves for Industrial Process Type Emissions Used in the Particulate Control Strategies Evaluated for the MCIAQCR.

Figure 2-10. ALLOWABLE PARTICULATE EMISSIONS BASED ON THE POTENTIAL OR UNCONTROLLED SOURCE EMISSIONS APPLIED TO INDUSTRIAL PROCESS, FUEL COMBUSTION, & SOLID WASTE DISPOSAL



these standards with the resulting ground level concentration values and required emission reductions allows an informal choice regarding that set of control standards most suited to the needs of the MCIAQCR.

2.4.2 Particulate Simulation Results

After the 18 particulate control strategies described in the previous section were selected, a control strategy simulation was carried out. This simulation predicted ground level particulate concentrations on the basis of the verified atmospheric diffusion model discussed in Section 2.3.

Table 2-2 provides a brief summary of the results of this exercise. The task at this stage was to select a small group of potentially feasible control alternatives for further detailed analysis. The two receptor sites noted in this tabulation were selected as being roughly descriptive of the overall regional air quality.

Three relatively distinct groups of control strategies can be defined in Table 2-2. The first group consists of Strategies 1 through 5 and essentially represents various combinations of emission standards already being applied in political jurisdictions within the MCIAQCR. In general, these strategies had a fairly low regional cost and could be administered rather easily. None of them, however, appeared to give promise of achieving regional air quality standards of 65 $\mu g/m^3$ (75 $\mu g/m^3$ in Indiana). It was decided that Control Strategy 1, existing regulations, should be included in the more detailed strategy analysis.

Strategies 6 through 9 represented variations in maximum control technology. In general, these strategies could be characterized by having rather high regional control costs but producing acceptable air quality values. Strategy 7 was included in the more detailed analysis since the strategy should apply the most effective control techniques throughout the region. The administrative acceptability of this type of regulation was not great, but a view of the best control technology was desired in the detailed analysis.

The third group of control strategies, Numbers 10 through 18, represented various combinations of proposed or existing emission control standards from throughout the country. All seemed to produce acceptably low ground level concentrations. Strategies 14 through 17 also were rela-

Strategy Number	Regional Control Cost* ($ in millions)	Selected Receptor Concentration ($\mu g/m^3$)	
		264	269
Existing		134.8	141.8
1	1.7	80.0	83.7
2	3.0	79.5	82.9
3	2.7	79.0	82.6
4	2.2	79.8	83.3
5	1.9	79.3	83.0
6	20.0	63.5	66.5
7	6.4	67.7	70.9
8	5.9	71.0	75.7
9	5.6	71.5	76.6
10	7.0	65.1	68.5
11	6.9	65.3	68.9
12	7.2	64.9	68.3
13	7.0	65.1	68.8
14	3.7	68.8	71.5
15	3.5	64.5	67.8
16	3.9	64.2	67.2
17	3.7	64.3	67.6
18	not tested		

*Control Cost of Point Sources Only

Table 2-2. INITIAL SCREENING OF PARTICULATE CONTROL STRATEGIES

tively low in cost and were considered feasible in terms of practical administrative considerations. Strategies 15 and 18 were selected to complete the group of four strategies for more detailed analysis. (Strategy 18 was not tested in the initial screening but was considered to be similar in stringency to those in the 14 to 17 group.)

After the initial strategy simulation runs, a number of minor errors in the emission inventory data base was discovered and corrected. Certain suspected program malfunctions were also investigated. The more detailed control strategy summaries cannot be compared with the output presented in Table 2-2. The general results, however, were similar in both cases.

Table 2-3 presents more complete information on those strategies selected during the initial screening procedure. The maximum receptor concentration occurring after application of each strategy is presented. Also, the emission reduction percentages are shown for both point and area sources and the new emission rates for these categories.

Strategy 1, existing regulations, appears totally unlikely to achieve satisfactory regional air quality and was dismissed from further consideration.

The maximum concentrations reported for the other control strategies must be interpreted with a certain degree of care. Only for strategy 15 was a reduction in area source emissions projected. This was done as a test to determine the effect this factor had on receptor concentrations. It was felt on the basis of reduction in open burning throughout the region and trend in fuel usage toward natural gas and away from coal for small fuel users that this degree of reduction would be reasonable for any of the three strategies. On this basis the maximum concentration would be least (probably between 60 and 65) for Strategy 7. Strategy 18 would be essentially equal to Strategy 15. Since all three control strategies appear to be able to achieve the regional air quality standards within the limits of simulation modeling accuracy, the final selection of a control strategy to be proposed for the MCIAQCR was left to practical administrative and technical considerations.

Strategy 7 was considered to be quite difficult to administer and since its regional cost nearly doubled that of the other two strategies, it was eliminated.

	POINT SOURCES		AREA SOURCES				
Strategy Number	Percent Reduction	New Emissions Rate (ton/day)	Percent Reduction	New Emission Rate (tons/day)	$\$ \times 10^6$	$/ton removed	Maximum Receptor ($\mu g/m^3$)
Existing		386.7		212.6			150.5
1	72.3	102.5	--	212.6	1.6	15.	137.9
7	97.1	11.7	--	212.6	6.1	44.	76.1
15	89.2	41.8	33.	142.4	3.3	26.	69.2
18	87.1	49.0	--	212.6	3.4	28.	81.9

Table 2-3. DETAILED RERUN OF SELECTED GROUP OF STRATEGIES FOR MCIAQCR

Strategy 15 was chosen over Strategy 18 since it contains more familiar types of emissions standards. For this reason it was considered to be politically more acceptable and administratively easier to handle.

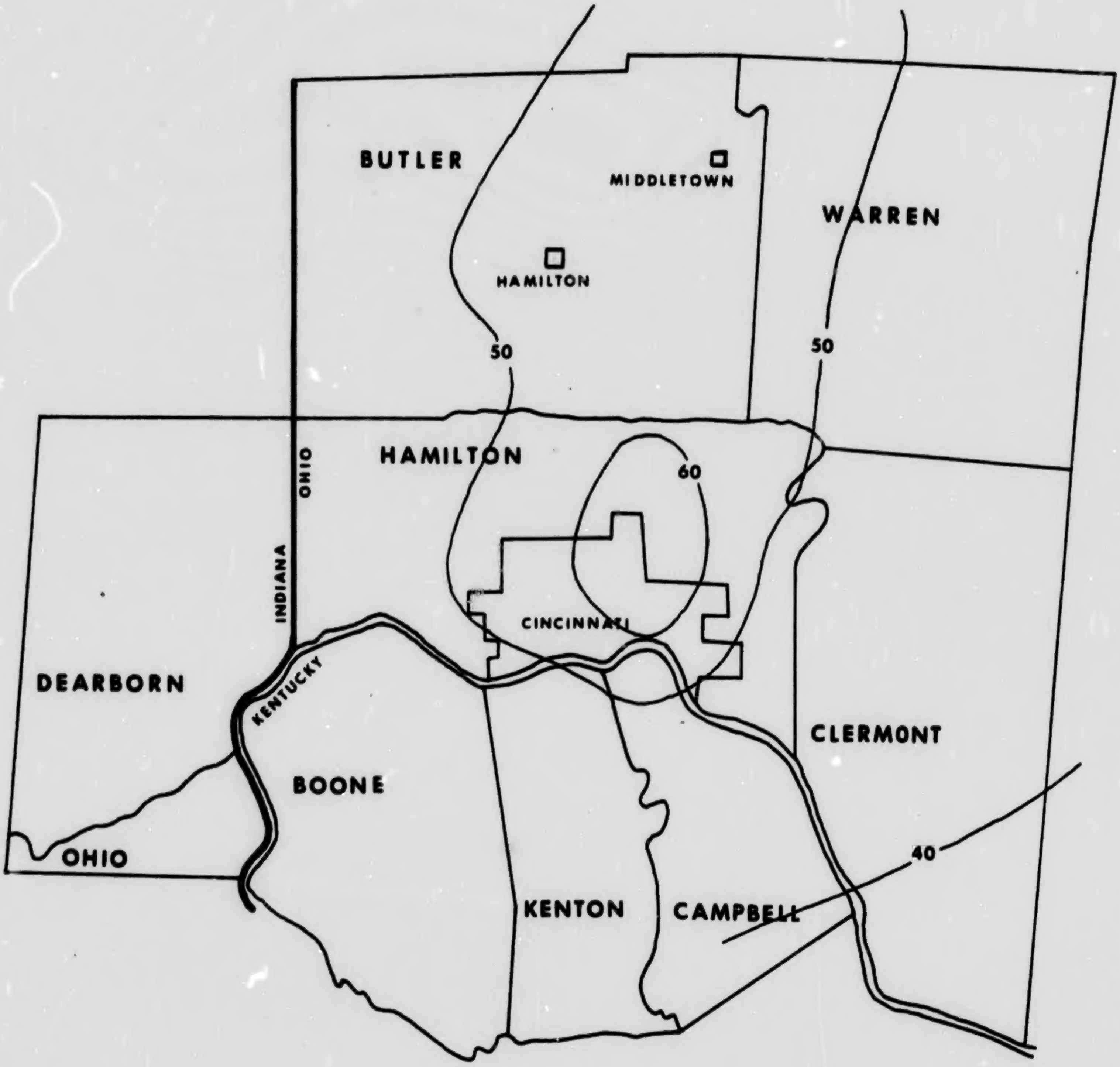
A detailed breakdown of the emission reductions required under Strategy 15 is presented in Table 2-4. Examination of this table, coupled with a review of particular source-control device combinations, lead to the conclusion that although significant emission reductions are required, they are not beyond the state-of-the-art in control technology.

An isopleth plot of ground level particulate concentrations after application of this strategy, as shown in Figure 2-11. Comparison with the plot of existing concentrations (Figure 2-6) graphically shows the improvement in regional air quality expected following application of Control Strategy 15.

To insure that the selected set of control standards would indeed be able to achieve and maintain acceptable air quality levels over the next several years, an exercise was carried out to project emission rates to the year 1980. These projections were based on economic projections for the MCIAQCR supplied by the United States Department of Commerce. Factors with which to scale existing emission levels were developed for each industrial classification. The revised emission rates expected for the year 1980 are displayed in Table 2-5. Factors were developed to project emission levels based on the 1969 emission inventory to a 1980 basis. These projections were by industrial and commercial categories. The same percentage control of emissions that is currently required was assumed to continue thooughout the projection period. As can be seen, the overall regional emission rate actually declines slightly during this ten-year period. The decline is basically due to large increases projected for relatively nonpolluting industrial classifications and to a change in regional fuel usage toward increased use of natural gas and oil. Based on this anaylyis the emission standards comprising Particulate Control Strategy 15 appears to be suitable to the needs of the MCIAQCR. Figure 2-12 displays the projected ground level concentrations for 1980.

			SOURCE CLASSIFICATION				
			Industrial				
Political Jurisdiction	Area	Apartment Commercial Government	Fuel Combustion	Process	Power Plants	Solid Waste	Total
Cincinnati							
Existing	8030	708	2464	365	0	1555	13,122
Controlled	5402	354	650	365	0	376	7,147
% Reduction	32.7	50.0	73.6	0	0	75.8	45.5
Indiana							
Existing	1679	0	894	91	23,634	489	26,787
Controlled	1131	0	117	91	1,482	0	2,821
% Reduction	32.6	0	86.9	0	93.7	100	89.5
Kentucky							
Existing	4526	44	18	7490	0	529	12,607
Controlled	3029	29	18	544	0	0	3,621
% Reduction	33.1	33.3	0	92.7	0	100	71.3
Ohio							
Existing	19012	0	22177	16,969	58,104	5592	121,855
Controlled	12738	0	3099	2,427	5,577	124	3,966
% Reduction	33.0	0	86.0	85.7	90.4	97.8	80.3
Region							
Existing	33248	752	25554	24,915	81,738	8165	174,371
Controlled	22301	383	3884	3,427	7,059	500	37,555
% Reduction	32.9	49.0	84.8	86.3	91.4	93.9	78.5

TABLE 2-4 . PARTICULATE EMISSIONS FOLLOWING APPLICATION OF PROPOSED EMISSION STANDARDS BASED ON 1969 EMISSION INVENTORY. (TONS OF PARTICULATE/YEAR)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DEARBORN
CLERMONT
BOONE
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OHIO
KENTON
CAMPBELL

Figure 2-11. Predicted Ground Level Concentrations Following Application of Proposed Control Strategy (1969 Emission Inventory)

Note: Annual Average Concentrations in $\mu g/m^3$

		SOURCE CLASSIFICATION					
			Industrial				
Political Jurisdiction	Area	Apartment Commercial Government	Fuel Combustion	Process	Power Plant	Solid Waste	Total
Cincinnati							
Existing	8030	741	3467	434	0	5209	17,881
Controlled	5402	369	912	434	0	1259	8,377
% Reduction	32.7	50.0	73.6	0	0	75.8	53.2
Indiana							
Existing	1679	0	1172	139	23,634	1639	28,262
Controlled	1131	0	153	139	1,482	0	2,905
% Reduction	32.6	0	86.9	0	93.7	100.0	89.7
Kentucky							
Existing	4526	55	22	9191	0	1774	15,567
Controlled	3029	36	22	668	0	0	3,756
% Reduction	33.1	33.3	0	92.7	0	100.0	75.9
Ohio							
Existing	19012	0	31467	20279	9,213	18732	98,703
Controlled	12738	0	4398	2902	887	416	21,342
% Reduction	33.0	0	86.0	85.7	90.4	97.8	78.4
Region							
Existing	33248	796	36128	30043	32,846	27353	160,414
Controlled	22301	405	5485	414	2,369	1675	37,380
% Reduction	32.9	49.1	84.8	86.2	92.8	93.9	77.3

TABLE 2-5. PARTICULATE EMISSIONS FOLLOWING APPLICATION OF PROPOSED EMISSION STANDARDS BASED ON PROJECTED 1980 EMISSION LEVELS. (TONS OF PARTICULATES/YEAR)

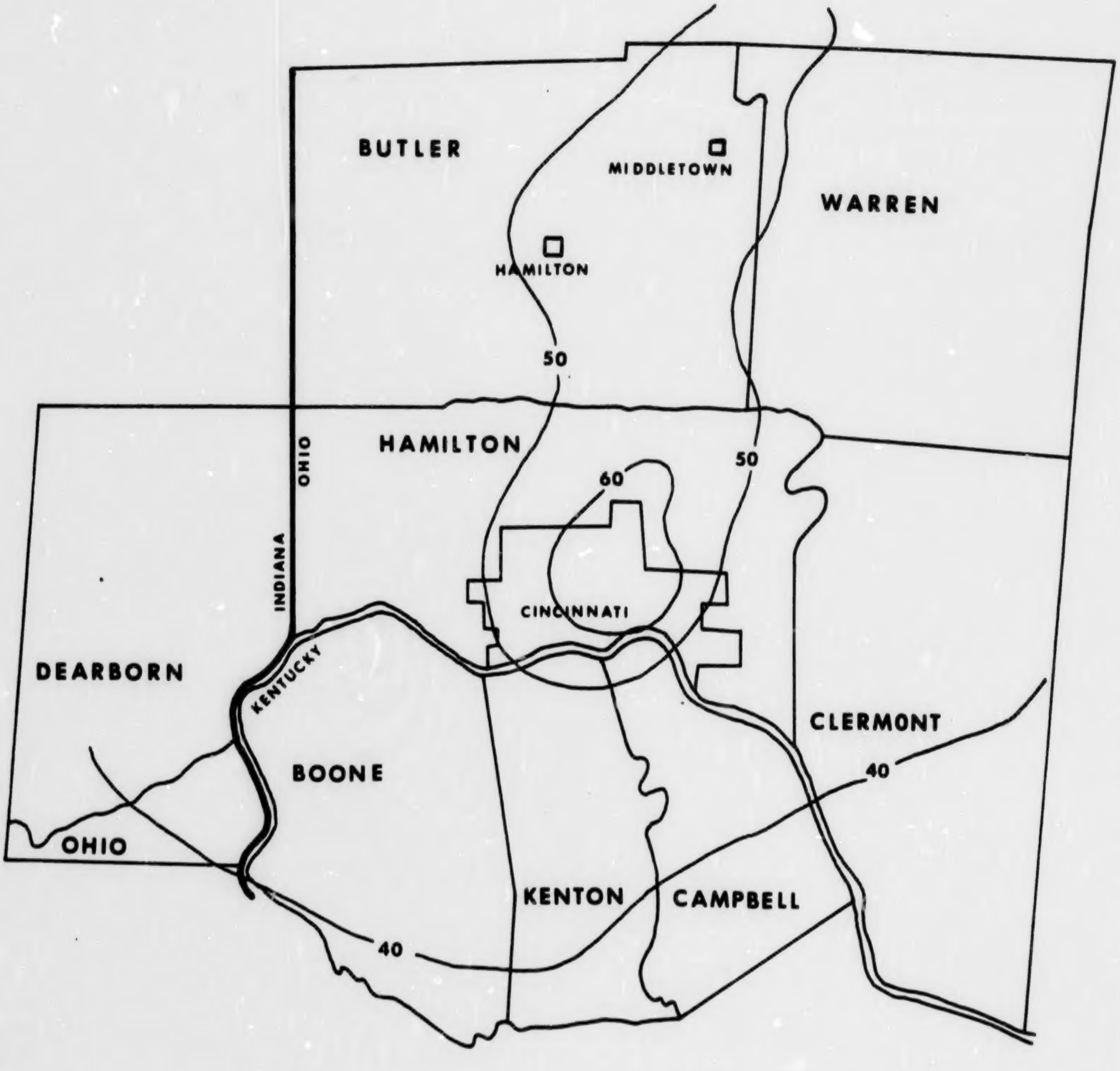
BUTLER
MIDDLETOWN
WARREN
HAMILTON
50
HAMILTON
OHIO
INDIANA
50
60
CINCINNATI
DEARBORN
KENTUCKY
CLERMONT
40
BOONE
OHIO
KENTON
CAMPBELL
40

Figure 2-12. Projected Ground Level Particulate Concentration Following Application of Proposed Control Strategy (Projected 1980 Emission Levels)

Note: Annual Average Concentration in $\mu g/m^3$

2.4.3 Sulfur Oxides Control Strategy

It was not possible on the basis of available air quality and emission data to develop a suitable annual verification of the diffusion model for sulfur oxides. (See Section 2.3.2.) Control strategy development for this pollutant had to be undertaken by the use of rollback considerations. (The computer simulation exercise, however, was still performed on a limited group of control strategies. The amount of pollutant reduction required under various emission reduction plans is necessary input to this strategy section procedure. Four sulfur oxide control strategies were simulated on a regional basis. Each of these strategies applied specific restrictions to the fuels used within the MCIAQCR. The four strategies, in order of increasing stringency, are defined as follows:

1. Limitation of all fuel to 1.25% sulfur content or less
2. Limitation of all fuel to 0.8% sulfur content or less
3. Limitation of all fuel to 0.3% sulfur content or less
4. Switch of all combustion sources to the use of natural gas

On an annual basis, the limited air quality data for SO_2 available in the MCIAQCR indicate that ambient SO_2 levels are not exceeding the Air Quality Standard (Ohio and Indiana) of 43 $\mu g/m^3$. On a short-term basis, however, the existing levels exceed the standards. This is discussed in more detail in Section 1.7.

During the three-month effort to collect data for this study (November 1969 through January 1970) periods were observed during which the average for 24 hours and for one hour were higher than allowed by the standard. At sampling station number 77(located in Ohio),the maximum hourly average was 1000 $\mu g/m^3$. This is compared with an Air Quality Standard (Ohio and Kentucky) for the maximum one-hour average in any year of 858 $\mu g/m^3$. Since the sampling only covered a period of three months, a minimum reduction of 14% in ambient air quality is required to comply with air quality standards.

During this same period, sampling station number 70 (located in Ohio) recorded a maximum 24-hour average of 371 $\mu g/m^3$. The maximum 24-hour average allowed by the Air Quality Standards (in all jurisdictions*) is 286 μg/m^3. An overall reduction in sulfur dioxide pollution levels of 23% will be required to bring this value into compliance with the standards. The observations cited in this and the preceding paragraph indicate that air pollution levels need to be reduced approximately 20 to 25%.

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*Ohio's standard specified that this value shall not be exceeded more than 1% of the time.

An examination of continuous air monitoring data collected over a period of six months is shown in Table 2-6. These data also reveal the existence of undesirably high, short-term, sulfur dioxide concentrations. In particular, the hourly maximum for April 1970 was 1550 μg/m^3. This value exceeds the adopted air quality standard of 858 for this averaging time by about 45%. These excessive short-term concentrations illustrate the need for a regional reduction of sulfur oxides emissions.

A reduction of each sulfur oxide source in the region by the specified percentage is not an administratively attractive nor technically sound control alternative. Since the majority of this type of pollutant emission is generated by fuel combustion, various control alternatives limiting allowable fuel sulfur content were examined. Reduction of the allowable sulfur content in fuels to 0.3% or 0.8% produced greater emission reductions than would seem to be required by the observational data cited above. The application of the existing City of Cincinnati fuel sulfur content regulation throughout the region was determined to produce sufficient emission reductions. This regulation has been proven to be technically and administratively feasible in one of the political jurisdictions comprising the MCIAQCR and is recommended in this implementation plan as the basis for a regionwide sulfur oxides control strategy. A slight change to the existing Cincinnati regulations is proposed for non-power plant fuel combustion sources. According to the detailed emission inventory information compiled for this study, nearly all smaller fuel users within the region are already using fuel with less than 1.0% sulfur content. Accordingly, to prevent increases in emission from these source categories, the proposed limitation on sulfur content in fuels not used for electrical power generation is set at 1.0%.

Table 2-7 displays the emission reductions required by the adoption of this strategy on a regionwide basis. By far, the greatest reduction in sulfur oxide emissions occurs in the electric power generation source category. This reflects the fact that these sources are the only significant users of high sulfur fuels in the region. This pattern of emission reduction

Table 2-6. AMBIENT SULFUR DIOXIDE CONCENTRATIONS AS MEASURED AT THE CAMP STATION, CINCINNATI

Period	Arithmetic Mean Concentration*	24-Hour Maximum*	One-Hour Maximum*
January 1970	136	286	675
February 1970	94	186	758
March 1970	68	305	780
April 1970	55	251	1550
May 1970	31	106	638
June 1970	24	106	492

*All concentrations are in units of $\mu g/m^3$.

SOURCE CLASSIFICATION

Political Jurisdiction	Area	Apartment Commercial Government	Fuel Combustion	Process	Power Plants	Solid Wastes	TOTAL
Cincinnati							
Projected	7,227	1,576	3,398	0	0	390	12,592
Controlled	7,227	1,576	3,398	0	0	390	12,592
% Reduction	0	0	0	0	0	0	0
Indiana							
Projected	1,204	0	1,328	0	123,844	14	126,392
Controlled	1,204	0	1,328	0	50,895	14	53,443
% Reduction	0	0	0	0	58.9	0	57.7
Kentucky							
Projected	3,029	102	0	0	0	14	3,146
Controlled	3,029	102	0	0	0	14	3,146
% Reduction	0	0	0	0	0	0	0
Ohio							
Projected	12,632	0	25,017	8,584	196,052	2,047	244,334
Controlled	12,632	0	20,856	2,609	93,206	2,047	131,352
% Reduction	0	0	16.6	69.6	52.5	0	46.2
REGION							
Projected	24,093	1,679	29,743	8,584	319,896	2,467	386,465
Controlled	24,093	1,679	25,582	2,609	144,102	2,467	200,534
% Reduction	0	0	14.0	69.6	55.0	0	48.1

Table 2-7. EFFECT OF PROPOSED SULFUR OXIDES CONTROL STRATEGY ON MCIAQCR EMISSION LEVELS (tons of pollutant/year)(based on 1969 Emission Inventory)

appears to be consistent with the goal of reducing maximum short-term ambient concentrations. Large emission sources are very important under the unfavorable meteorological conditions which cause the highest hourly and daily concentrations.

Table 2-8 displays the result of the projection of regional growth and the associated sulfur oxide emissions to the year 1980. Despite projected regional population and commercial growth, the expected levels of sulfur oxide emissions remain fairly constant. For this reason, it appears that the proposed control strategy, as described above, will be adequate to achieve and maintain air quality standards during this period.

2.5 PROPOSED CONTROL STRATEGY

The following emission control strategies were selected for adoption throughout the MCIAQCR on the basis of procedures and considerations presented in the preceding section (2.4). These strategies represent emission limitation standards which, when adopted and enforced, should lead to acceptable levels of both suspended particulate and sulfur dioxide as defined by the regional Air Quality Standards. Legally enforceable control regulations based on these emissions standards are presented in Section 4.2.

The proposed particulate control strategy consists of emission standards covering three general categories of emissions sources:

- Industrial Process Emissions

  Sources within this category are allowed emissions based on process weight as defined by curve A, Figure 4-11 covering this source category. (This standard is fully defined in Section 4.2, Proposed Control Regulations.)

- Fuel Combustion Emissions

  Allowable emissions are defined according to the curve B, Figure 4-10 for heat input versus mass particulate emission rate. (This standard is also presented in Section 4.2)

- Solid Waste Disposal

  Incinerators are allowed emissions of 4 pounds/ton of refuse charged and open burning is prohibited under the standard relating to this source category.

The proposed regional sulfur oxides control strategy consists of those emissions standards on which the regulations already in effect in the City of Cincinnati are based. Two emission categories are considered by these standards:

SOURCE CLASSIFICATION

Political Jurisdiction	Area	Apartment Commercial Government	Fuel Combustion	Process	Power Plants	Solid Wastes	TOTAL
Cincinnati							
Projected	7,227	1,569	4,883	0	0	1,306	14,986
Controlled	3,431	1,569	4,883	0	0	1,306	11,190
% Reduction	52.5	0	0	0	0	0	25.3
Indiana							
Projected	1,204	0	1,741	0	123,844	47	126,837
Controlled	547	0	1,741	0	50,900	47	53,652
% Reduction	52.5	0	0	0	58.9	0	57.7
Kentucky							
Projected	3,029	138	0	0	0	47	3,215
Controlled	1,423	138	0	0	0	47	1,609
% Reduction	52.5	0	0	0	0	0	49.9
Ohio							
Projected	12,632	0	35,058	13,041	76,536	6,858	144,127
Controlled	6,000	0	29,238	3,963	36,355	6,858	77,540
% Reduction	52.5	0	16.6	69.6	52.5	0	46/2
REGION							
Projected	24,093	1,708	41,683	13,041	200,381	8,259	289,167
Controlled	11,402	1,708	35,847	3,963	90,171	8,259	150,077
% Reduction	52.5	0	14.0	69.6	55.0	0	48.1

Table 2-8. EMISSIONS FOLLOWING APPLICATION OF PROPOSED SULFUR OXIDES CONTROL STRATEGY BASED ON 1980 EMISSION PROJECTIONS (tons of pollutant/year)

- Industrial Process Emissions

  Sulfur oxide emissions from industrial process are limited to 2000 parts per million by volume of the exhaust gas stream. Acid plants shall control to 36 pounds/ton acid for sulfuric acid plants.

- Fuel Combustion Emissions

  The maximum sulfur content of fuel used shall be 1.25% with 1.00% being the allowable limit for smaller combustion sources.

2.6 TIMETABLE FOR IMPLEMENTING PROPOSED REGULATIONS

Implementation of control regulations logically divides into two separate tasks. First, the new regulation must be officially adopted. Second, field enforcement and control of pollution sources affected by the regulation must be carried out. The length of time required to carry out these actions are discussed in the following two sections.

2.6.1 Adoption of Proposed Control Regulations

The Ohio Air Pollution Control Board is empowered to adopt regulations but lacks the power to hold public hearings prior to this adoption. (See Section 3.6.) Also, the powers of the APC Board to enforce regulations appears somewhat restricted. Legislation was proposed in Section 3 which, when adopted, will correct these deficiencies. This corrective legislation will be passed by June 1971. Passage of the control regulations proposed in Section 4.2 may require from six to nine months, following the submission of this Plan.

The City of Cincinnati already has emission control regulations similar in stringency to those proposed in this document. It is anticipated that the modifications suggested in Section 4.2 will be adopted by the City within three to four months and that by July 1971 the City and State regulations will be essentially identical.

2.6.2 Enforcement of Control Regulations

The primary portion of the Ohio enforcement program will be the permit and source surveillance system described in Section 6.2. The review of the existing Ohio Legislative Authority (Section 3) revealed that action by the State Legislature will be necessary before a permit system can be established and operated by the APC Board. Legislation to accomplish this purpose was proposed in Section 3, and it is anticipated that this will be enacted by June 1971. Action by the State APC Board to establish the permit system following the legislation will be taken by July 1971. It is anticipated that source registration and surveillance procedures and the permit system will be fully operational within 12 months following the adoption of the necessary legislation and regulations (July 1972). Coordination between air pollution control personnel of the City of Cincinnati and the Ohio Agency should facilitate this startup process. Actions to achieve compliance with the proposed control regulations will begin well before this time.

Particulate emission sources should be brought substantially into compliance with the new regulation by December 1972. There are no new control technologies necessary to being particulate emission sources into compliance with the proposed standards. The approximate 18-month period allowed for compliance after the adoption of the control regulations allows pollution sources an opportunity to design, fabricate or purchase, and install necessary control devices.

The regulations relating to sulfur oxides emissions control may require a longer period in which to achieve compliance. Choice of the most satisfactory control method is usually made by the source after all of the various technical, economic, political and social factors are given serious consideration. The options for fuel substitution are numerous. Natural gas, low sulfur fuel oil, low sulfur coal, and coal-derived gas or oil are available or can be made available at a price. Although considerable pilot plant work has been conducted and many processes are commercially available, the application of full-scale flue gas desulfurization processes to coal-fired power plants is limited. As soon as possible, but not later than six months after the adoption of the proposed control regulations, the applicable sources will be required to submit a control plan of how they will come into compliance. The control plans should cover no more than a two-year period. Therefore, by December 1973 the sources will be in compliance. During this period, the data from the air quality monitoring network will be closely observed to determine the exact trends in the sulfur dioxide concentrations in the Region. If this data indicates that additional control is needed, the Implementation Plan will be modified accordingly.

3. LEGAL AUTHORITY

3.1 SCOPE OF DISCUSSION

This section will address itself to legal deficiencies and remedies of the various aspects of air pollution control as they relate to the State of Ohio. A copy of the State Act authorizing and defining air pollution control is presented in Appendix B of this document. Generally, the discussion will be confined to the adequacy of legal authority to implement fully a control program, including the organization of regional enforcement activities, promulgation and enforcement of regulations, and implementation of emergency action. However, the legal aspects of the proposed emission control regulations are not discussed in this section.

In general, the format of this section is designed to identify the legal problems which exist in Ohio and the legislative and regulatory action necessary to remedy the deficiencies found in the air pollution control program.

3.2 GENERAL DISCUSSION OF THE POWERS OF ADMINISTRATIVE AGENCIES

It is the general rule that the powers of administrative agencies are limited by the intent of the legislature as expressed in the statutes. That is to say, administrative agencies have no inherent powers. Legislative intent may give rise to implied powers and the courts, in interpreting the powers of such agencies, are not limited by the mere words of the statute. This is especially true where the administration of health and safety is concerned. It is a general principle of law that every grant of power carries with it the reasonable use of necessary means for its effective execution. Thus, an administrative agency has every power which is indispensable to the powers specifically granted.

Notwithstanding liberal construction as regards health legislation, it is best to endow expressly the agency with the powers necessary to carry out the intent of the legislature. While the courts may uphold an agency's exercise of implied power, such litigation is time consuming and ought not to be encouraged by lack of legislative specificity. On the other hand, the intent of the legislature may be defeated by subsequent litigation if that body fails to express its intent in the statute.

3.3 CRITERIA FOR EFFECTIVE AIR POLLUTION REGULATION

Compliance with the requirements discussed in the previous section requires that legislative criteria be set. That is, a checklist of all the necessary elements of effective air pollution control legislation must be presented to determine that adequate authority is given the agency.

Thus, current statutes relative to air pollution regulation must be analyzed to determine that the legislature has expressed its intent and has defined "air pollution" so as to permit the administrative agency to act to prevent conditions which threaten to endanger the public health prior to the occurrence of actual injury. Additionally, the state agency must have sufficient authority to adopt regulations (e.g., emission control regulations), implement emergency action, gather and evaluate air quality and emissions data, require reporting of information, require permits to construct and to operate, grant and repeal variances, inspect facilities, test facilities, issue orders, hold hearings, subpoena witnesses and evidentiary materials, impose penalties, obtain injunctions, and grant enforcement powers to local agencies.

3.4 LEGISLATIVE INTENT

The General Assembly of the State of Ohio did not express its intent in adopting the Ohio Air Pollution Control Act. Ohio Revised Code §3704.03(D) gives the APC Board power to adopt regulations after giving consideration to "The character and degree of any injury to human health..." In the absence of expressed legislative intent, the language of §3704.03(D) implies that the protection of health is subject to equitable defenses much as property rights. The suggested language of the Council of State Governments[1] differentiates between health and property issues thus:

> "It is...the purpose of this Act to achieve and maintain such levels of air quality as will protect human health and safety, and to the greatest degree practicable, prevent injury to plant and animal life and property..."

Without vitiating the legislative guidelines set out in ORC §3704.03(D) and (E), the Council of State Governments' suggested language provides for adequate protection of health. The Ohio General Assembly will adopt a new code section as follows:

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[1] Suggested State Legislation, Vol. XXVI, 1967, State Air Pollution Control Act, Sec. 1, The Council of State Governments, Lexington, Kentucky.

Sec. 3704.01.1(A) It is hereby declared to be the public policy of this State and the purpose of this Act to achieve and maintain such levels of air quality as will protect human health and safety, and to the greatest degree practicable, prevent injury to plant and animal life and property, foster the comfort and convenience of the people, promote the economic and social development of this State and facilitate the enjoyment of the natural attractions of this State.
(B) It is also declared that local and regional air pollution control programs are to be supported to the extent practicable as essential instruments for the securing and maintenance of appropriate levels of air quality.
(C) To these ends it is the purpose of this Act to provide for a coordinated statewide program of air pollution prevention, abatement and control; for an appropriate distribution of responsibilities among the state and local units of government; to facilitate cooperation across jurisdictional lines in dealing with problems of air pollution not confined within single jurisdictions; and to provide a framework within which all values may be balanced in the public interest."

3.5 LEGISLATIVE DEFINITION OF "AIR POLLUTION"

Adequate air pollution control can only be realized if the administrative agency has the power to act to protect welfare and property as well as health and, in addition, to prevent conditions which reasonably threaten the public health and welfare. Therefore, it is necessary that the legislative definition of "air pollution" be sufficiently broad to encompass the above factors. Ohio state law definition of pollution[2] is sufficiently broad as to include those conditions which are injurious to property, or which unreasonably interfere with the comfortable enjoyment of life and property. The definition does not include those conditions which threaten to be injurious.

It could be argued that a threat of injury interferes with comfortable enjoyment.[3] While it has not been seen that the original definitions substantially impaired the agencies' ability to cope with situations which posed a mere threat to the public health or welfare, legislative clarification is preferred. The following statutory change will be adopted:[4]

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[2] Ohio Rev. Stat. §3704.01(B).

[3] "Comfortable enjoyment" is a term which signifies mental quiet as well as physical comfort.

[4] Underlining indicates new material; * indicates deletion.

> Ohio Rev. Code §3704.01(B):
> "Air Pollution" means the presence in the ambient air of one or more air contaminants or any combination thereof in sufficient quantity and of such characteristics and duration as * is or threatens to be injurious to human health or welfare, plant or animal life, or property, or which unreasonably interferes with the comfortable enjoyment of life or property."

The Ohio General Assembly will act on this amendment in 1971.

3.6 POWERS OF THE OHIO APC AUTHORITY

The 1967 Ohio Air Pollution Control Act[5] gives the Ohio Air Pollution Control Board the power to adopt and enforce ambient air quality standards, emission regulations, and other control regulations within the MCIAQCR. The Act does not provide authority for the implementation of emergency action. Further, authority to require the reporting of information and to adopt emission regulations is limited to those situations where the established ambient air quality standards are exceeded. Such restriction on the Board's authority to act is deemed to render such authority inadequate. Provisions are made for the granting of variances. However, the statutory language restricts such granting power to the State APC Board alone; and delegation of that function is not permitted under the Act. Nor can the authority to grant variances be delegated to a local political subdivision through an Interlocal Cooperation Act as can be done in Indiana. Putting such a burden on the five Board members alone appears to be both onerous and impractical.

Further, the Act does not provide authority for the Board to establish a permit system, issue orders, hold hearings, subpoena witness and evidentiary materials, or implement an emergency plan. Table 3-1 lists legislative power granted to the State APC Board as of July 1970. In addition to a legislative grant of authority, administrative authority is also necessary before information reporting and variance proceedings can be initiated. Such administrative authority results from the promulgation of regulations as required by the enabling legislation.

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[5] Ohio Rev. Code §§3704.01, et seq.

Table 3-1. ANALYSIS OF OHIO APC LAWS AND REGULATIONS AS OF JULY 1970

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
1. Definition of air pollution in State Law must be sufficiently broad to enable the agency to protect welfare and injury to property as well as health.	APC Board	ORC §3704.01(B)
2. Under the definition of air pollution, the agency must be able to control and prevent conditions which threaten or endanger the public health or welfare before the occurrence of actual injury.	APC Board	ORC §3704.01(B), Further clarification of the statute is desirable.
3. Power to hold public hearings relating to any aspect of the administration of air pollution laws and regulations		None
4. Power to adopt, amend and repeal rules and regulations.	APC Board	ORC §3704.03(E), Only in those areas where ambient air quality standards are exceeded.
5. Power to enforce the law by appropriate administrative and judicial proceedings, including injunctive relief.	APC Board	ORC §3704.06, Legal and equitable actions only.
6. Power to compel the attendance of witnesses at hearings and other administrative proceedings(subpoena power).		None

Table 3-1. ANALYSIS OF OHIO APC LAWS AND REGULATIONS AS OF JULY 1970

Desirable or Essential Powers	Agency Possessing Specific Powers	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
7. Power to gain access to records relating to emissions of air contaminants	APC Board	ORC §3704.03(G), Only in those areas where ambient air standards are being exceeded. ORC §3704.03(J).
8. Power to compel the production of books and records for use in administrative proceedings (subpoena power)		None
9. Power to secure necessary technical information by contract or otherwise	APC Board	ORC §3704.03(M) and (O)
10. Power to prepare comprehensive plans for the control of air pollution	APC Board	ORC §3704.03(A)
11. Power to collect and disseminate information concerning air pollution (including conduct of studies, investigations and research)		None
12. Power to establish ambient air quality standards and emission standards for all or parts of the State	APC Board	ORC §3704.03(D)(Air Quality Standards) ORC §3704.03(E)(Emission Standards); Only in those areas where Air Quality Standards are exceeded.

Table 3-1. ANALYSIS OF OHIO APC LAWS AND REGULATIONS AS OF JULY 1970

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
13. Power to classify air contaminant sources and require reports from such classes	APC Board	ORC §3704(G); Only in those areas where Air Quality Standards are exceeded.
14. Power to establish a permit system for the construction and operation of new sources and control apparatus as well as for the alteration of existing sources and control apparatus		None
15. Power to inspect, subject to legal limitations regarding search warrants, the locations of contaminant sources	APC Board	ORC §3704.03(K)
16. Power to conduct tests of emissions of air contaminants from any source	APC Board	ORC §3704.03(K)
17. Power to utilize variances subject to careful procedural and substantive controls	APC Board	ORC §3704.03(F)
18. Power to provide for the confidentiality of information acquired from private sources, without unduly restricting ability to enforce the applicable law	APC Board	ORC §3704.08
19. Power to exercise emergency authority to limit or eliminate emissions from stationary sources within minimum delay		None

Table 3-1. ANALYSIS OF OHIO APC LAWS AND REGULATIONS AS OF JULY 1970

Desirable or Essential Powers	Agency Possessing Specific Power	Statute Expressly Conferring Specific Power or Regulation Implementing General Conferral of Power
20. Power to impose penalties for air pollution violations	APC Board	ORC §§3704.06 and 3704.99
21. Power to receive and administer grants or gifts made for the purpose of carrying out the statute and regulations	APC Board	ORC §3704.03(L)
22. Power to advise, consult, cooperate and enter into agreements with the governments and agencies of the adjacent States, and any interstate or regional agency representing any such State or political subdivision	APC Board	ORC §3704.03(B), Advise, consult, and cooperate only.
23. Power to take any action necessary to carry out statute and regulations	APC Board	ORC §3704.03(Q)
24. Power to delegate performance of duties to a subordinate agency.		ORC §3704.11 APC Act does not limit authority of local political subdivisions.

It is proposed that legislative action be taken to grant the powers necessary for operation of a viable program. Legislation will be passed giving the Board authority to establish a construction and operation permit system, require the reporting of information, grant variances permits through appointed representatives, issue orders, and hold hearings. This will be accomplished by amending statute §3704.03, the pertinent parts of which read as follows:[6]

> Sec. 3704.03 The Air Pollution Control Board shall have power to:
>
> (F) Any person who owns or is in control of any plant, building, structure, establishment, process or equipment may apply to the State Air Pollution Control Board for a variance from rules or regulations. The State Air Pollution Control Board may grant such variance, but only after public hearing on due notice, if it finds that:
>
> 1. The emissions occurring or proposed to occur do not endanger or tend to endanger human health or safety; and
> 2. Compliance with the rules or regulations from which variance is sought would produce serious hardship without equal or greater benefits to the public.
>
> (G) No variance shall be granted pursuant to this Section until the State Air Pollution Control Board has considered the relative interests of the applicant, other owners of property likely to be affected by the discharges, and the general public.
>
> (H) Any variance or renewal thereof shall be granted within the requirements of subsection (F) and for time periods and under conditions consistent with the reasons therefor, and within the following limitations:
>
> 1. If the variance is granted on the ground that there is no practicable means known or available for the adequate prevention, abatement or control of the air pollution involved, it shall be only until the necessary means for prevention, abatement or control become known and available, and subject to the taking of any substitute or alternate measures that the State Air Pollution Control Board may prescribe.
> 2. If the variance is granted on the ground that compliance with the particular requirement or requirements from which variance is sought will necessitate the taking of measures which, because of their extent or cost, must be spread over a considerable period of time, it shall be for a period not to exceed such reasonable time as in the view of the State Air Pollution Control Board is requisite for the taking of the necessary measures. A variance granted on the ground

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[6] Underlining indicates new materia; * indicates deletion

specified herein shall contain a timetable for the taking of action in an expeditious manner and shall be conditioned on adherence to such timetable.

3. If the variance is granted on the ground that it is justified to relieve or prevent hardship of a kind other than that provided for in items 1 and 2 of this subparagraph, it shall be for not more than one year.

(I) Any variance granted pursuant to this Section may be renewed on terms and conditions and for periods which would be appropriate on initial granting of a variance. If complaint is made to the State Air Pollution Control Board on account of the variance, no renewal thereof shall be granted, unless following public hearing on the complaint on due notice, the State Air Pollution Control Board finds that renewal is justified. No renewal shall be granted except on application therefor. Any such application shall be made at least 60 days prior to the expiration of the variance. Immediately upon receipt of an application for renewal the State Air Pollution Control Board shall give public notice of such application in accordance with rules and regulations of the State Air Pollution Control Board.

(J) A variance or renewal shall not be a right of the applicant or holder thereof but shall be in the discretion of the State Air Pollution Control Board. However, any person adversely affected by a variance or renewal granted by the State Air Pollution Control Board may obtain judicial review thereof in the manner provided by the State Administrative Procedure Act. Notwithstanding any other provision of this Act, judicial review of the denial of a variance or denial of renewal thereof may be had only on the ground that the denial was arbitrary or capricious.

(K) Nothing in this Section and no variance or renewal granted pursuant hereto shall be construed to prevent or limit the application of the emergency provisions and procedures of this Act to any person or his property.

(L) Require the person responsible for any source of emissions which may reasonably be considered as being a source of or contributing to air pollution * to file reports with the board containing information which is reasonably available as to location, size and height of emission outlets, and the rate, duration, and composition of emissions;

(M) Prohibit the construction, installation, alteration, or use of any installations, which may reasonably be considered as being a source of or contributing to air pollution unless an appropriate permit therefore has been obtained from the Board or its authorized representatives.

(N) Hold hearings relating to any aspect of the administration of sections 3704.01 to 3704.11, inclusive, of the Revised Code, and, in connection therewith, compel the attendance of witnesses and the production of evidence.

(O) Issue such orders and make such determination as may be necessary to effectuate the purposes of sections 3704.01 to 3704.11, inclusive, of the Revised Code, and enforce same by all appropriate administrative and judicial proceedings.

Former divisions H through Q of section 3704.03 shall be redesignated K through T in the same order as they formerly appeared.

Due to the amendments to section 3704.03, section 3704.04 will be amended as follows:

> Sec. 3704.04. The adoption, modification, and repeal of regulations under divisions (d) and (e) of section 3704.03 of the Revised Code and the issuance, revocation, modification, and denial of permits under divisions (F) and (H) of section 3704.03 of the Revised Code shall be in accordance with sections 119.01 to 119.113, inclusive of the Revised Code, except that the notice of appeal required under section 119.11 of the Revised Code shall not stay the effective date of any regulation adopted under division (D) or (E) of section 3704.03 of the Revised Code. Such a stay may be granted by the court for good cause but shall be effective only as to the party appealing the order adopting, modifying, or repealing such regulations.

And the pertinent divisions of section 3704.05 will be amended to read:

> (D) No person shall refuse entry to a member of the board or its authorized representative as provided in divisions (F) and * (N) of section 3704.03 of the Revised Code.
>
> (F) No person shall fail to comply with any determination or order of the Board promulgated pursuant to division (J) of section 3704.03 of the Revised Code.

The above amendments to the Ohio Air Pollution Control Act will be considered during the 1971 session of the Ohio General Assembly.

Additionally, action will be necessary on the part of the Board to adopt regulations for the reporting of information and the establishment of procedural guidelines for the application of variances, and installation and operation permits. It is anticipated that these regulations can be adopted early in 1971.

3.7 IMPLEMENTATION OF EMERGENCY ACTION

Legislation enabling state agencies to deal effectively with air pollution emergencies is specifically required under the Federal Clean Air Act, as amended 1967. Unlike the air pollution control laws of its sister states, implementation of emergency action is not one of the enumerated powers of the Ohio Board (Table 3-1). However, the Board has emergency powers by inference. Notwithstanding, it is recognized that additional legislation will be necessary to confer adequately this power on the State Board.

It is, therefore, proposed that legal authority to implement emergency action be given the Ohio Air Pollution Control Board through the adoption of a new Section 3704.031 which reads as follows:

> (A) Any other provisions of law to the contrary notwithstanding, if the Director finds that a generalized condition of air pollution exists and that it creates an emergency requiring immediate action to protect human health or safety, the Director, with the concurrence of the Governor, shall order persons causing or contributing to the air pollution to reduce or discontinue immediately the emission of air contaminants, and such order shall fix a place and time, not later than twenty-four hours thereafter, for a hearing to be held before the State Air Pollution Control Board. Not more than twenty-four hours after the commencement of such hearing, and without adjournment thereof, the State Air Pollution Control Board shall affirm, modify or set aside the order of the Director.
>
> (B) In the absence of a generalized condition of air pollution of the type referred to in subsection (A), but if the Director finds that emissions from the operation of one or more air contaminant sources is causing imminent danger to human health or safety, he may order the person or persons responsible for the operation or operations in question to reduce or discontinue emissions immediately, without regard to other provisions of this Act. In such event, the requirements for hearing and affirmance, modification or setting aside of orders set forth in subsection (A) shall apply.
>
> (C) Nothing in this Section shall be construed to limit any power which the Governor or any other officer may have to declare an emergency and act on the basis of such declaration, if such power is conferred by statute or constitutional provision, or inheres in the office.

As with the revisions to §3704.03, the proposed §3704.301 will be presented to the Ohio Legislature in late summer, 1971.

In addition to providing the authority to take intrastate emergency action, it is necessary to provide for emergency abatement action where the pollutants from one state cause the ambient air quality in another state to reach episode levels. The aggrieved state should have statutory as well as common law remedies. Therefore, an interstate emergency action plan for an episode avoidance agreement will be adopted by each of the three states making up the MCIAQCR. The Ohio General Assembly shall amend ORC §3704.031 to provide the Air Pollution Control Board with authority to enter into the agreement. No legislative action is required by Indiana or Kentucky since their state agencies have authority to enter into the agreement under the Interlocal Cooperation Act which both states have adopted.

Ohio's Air Pollution Control Board will initially seek the somewhat limited power from the Legislature because it does not appear that the latter body is presently amenable to such broad legislation as an Interlocal Cooperation Act. It is felt, therefore, that the limited authority can be more easily obtained. The amendments to ORC §3704.031 relative to Interlocal Cooperation will consist of adding subsections (D) through (H) as follows:

> (D) Any power or powers granted to the Air Pollution Control Board in subsections (A) and (B) of this section may be exercised jointly with the air pollution control agency of any number of, or all of, the state continguous to this state.
>
> (E) Administration of a joint episode program shall be provided through a joint board on which all state air pollution control agencies party to the joint agreement shall be represented.
>
> (F) The Air Pollution Control Board is hereby empowered to enter such interstate agreement or compact to provide for the joint control or avoidance of emergency conditions and may appropriate funds and supply such personnel and services as may be appropriate for the joint undertaking.
>
> (G) Any such agreement shall specify the following: (1) Its duration; (2) the precise organization, composition of the joint board created thereby together with the powers delegated thereto; (3) its purpose; (4) the manner of financing, staffing, and supplying the undertaking and of establishing and maintaining a budget therefor; (5) the permissible method or methods to be employed in accomplishing the purpose of the agreement.

> (H) Prior to its being in force, an agreement made pursuant to this section shall be filed with the secretary of state. The agreement shall have the status of an interstate compact, but in any case or controversy involving performance or interpretation thereof or liability there under, the public agencies party thereto shall be real parties in interest and the state may maintain an action to recoup or otherwise make itself whole for any damages or liability which it may incur by reason of being joined as a party therein. Such action shall be maintainable against any public agency or agencies whose default, failure or performance, or other conduct caused or contributed to the incurring of damage or liability by the state.

The resulting interstate agreement will provide that abatement action may be taken by the Joint Emergency Board against any polluter in any of the party states.

3.8 ORGANIZATION OF REGIONAL ENFORCEMENT ACTIVITIES

Ohio's Air Pollution Control Act provides basic authority[7] for enforcement of air pollution control regulations throughout the entire state. Local boards of health and cities have authority to maintain an air pollution control program. However, the State Air Pollution Control Board has superior and concurrent jurisdiction. Thus, the Board may, under existing legislation, establish a regional program. In so doing, it may contract for services with private contractors or with such agencies as the City of Cincinnati.

Further, the Board may participate with the Indiana Board and the Kentucky Commission in an interstate planning endeavor. Ohio Revised Code §3704.03(B) gives the Board power to "... consult and cooperate with any governmental or private agency in the furtherance of the purposes of (the Air Pollution Control Act)". Whether the vehicle for such cooperative action is a joint effort of monitoring and data processing or an interstate regional planning commission formed pursuant to ORC §§713.30 through 713.34 does not appear to affect the Board's ability to participate.

It is, therefore, not deemed necessary that additional legislative action be taken for the proposed organization of regional operations within the Ohio portion of the MCIAQCR.

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[7] As to the extent and limitations of such authority, see 4.6, supra.

3.8.1 City of Cincinnati

Cincinnati, through its home rule powers, may maintain an air pollution control program and has done so. The City also has the power to contract with other governmental entities for services. In 1970, Cincinnati was providing air pollution control services to eight outlying communities. Similar services may be rendered in varying degrees to the three state authorities within the Region pursuant to a contractual arrangement.

3.9 INTERSTATE PLANNING AND SERVICES AUTHORITY

Interstate cooperation in the form of planning and computerized support services is a necessary element of the proposed regional strucutre. Services are generally provided by contract with the City of Cincinnati[8] and by contract with an interstate planning authority. Existing Ohio Law[9] permits any board of county commissioners and the legislative authority of any municipality to cooperate with other such entities in Ohio and in sister states to create by agreement an interstate regional planning commission. The various political subdivisions in Indiana and Kentucky are empowered to enter such agreement pursuant to the authority given them by the states' Interlocal Cooperation Act.[10] Since Ohio lacks such an act, the language of ORC §§713.30 through 713.34 will control the activities and purposes of such an endeavor until appropriate legislation is passed (Section 3.6). Therefore, it is necessary to consider the proposed interstate activities in light of this statute. These activities included:

a. Exchange of information
b. Air pollution control planning and coordination
c. Providing regional computer services

It appears that a Regional Planning Commission will have adequate authority to conduct a program of information exchange and air pollution control planning and coordination. ORC §713.33(A) states that the "Commission may make studies, maps, plans, and other reports relative to the region and shall recommend procedures and policies to the appropriate authorities, based on physical ... conditions and trends, to promote ... the general health, welfare, convenience, and prosperity of the people of the region" (emphasis supplied).

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[8] See 3.8.1, supra.

[9] Ohio Rev. Code §§713.30, et seq.

[10] Indiana Stat. §§53-1101, et seq.; Kentucky Rev. Stat. §§65.210, et seq.

There is some question whether the existing legislation grants the Regional Planning Commission adequate authority to engage in providing computer services other than for planning and regional development purposes. The tenor of the legislation implies a legislative intent to provide for regional development only. However, the Ohio General Assembly fails to express specifically its intent; and there is some basis to the stand that the commission would indeed have authority to provide such services. Mr. William Vodra, legal counsel for Ohio-Kentucky-Indiana Regional Planning Authority, Inc., feels Ohio Revised Code §713.33(B)(4) grants adequate authority in that regard, although legislative clarification is desirable.[11]

3.10 SUMMARY OF LEGISLATIVE AND ADMINISTRATIVE ACTIONS NEEDED TO EFFECT THE IMPLEMENTATION PLAN

The preceding discussion pointed out the legal and administrative deficiencies which had existed in the Ohio program and the remedial actions which will be taken. These actions are summarized for Ohio in the following table.

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[11] Meeting with William Vodra, Cincinnati, Ohio, May 1, 1970.

Table 3-2. SUMMARY OF LEGISLATIVE AND ADMINISTRATIVE ACTIONS TO BE TAKEN TO EFFECT THE IMPLEMENTATION PLAN FOR THE STATE OF OHIO

Responsible Body	Effective Date	Purpose	Discussed on Page No.
Legislature	January 1971	Adopt ORC §3704.01.1 to declare a legislative intent	3-2
Legislature	June 1971	Amend ORC §3704.01(B) to define air pollution sufficiently broad to abate prior to actual occurrence of injury	3-3
Legislature	June 1971	Amend ORC §3704.03 to give State APC Board power to establish permit system, require the reporting of information, grant variances through appointed representatives, issue orders, hold hearings, and subpoena witnesses and evidence.	3-9
Legislature	June 1971	Amend ORC §§3704.04 and 3704.05 to conform with amended 3704.03	3-11
APC Board	July 1971	Information reporting	3-11
APC Board	July 1971	Adopt procedures for variances	3-11
APC Board	July 1971	Adopt procedures for permit system	3-11
Legislature	August 1971	Adopt ORC §3704.03.1 to give State APC Board adequate authority to take emergency action	3-13
Legislature	June 1973	Amend ORC§3704.031 to give State APC Board authority to enter into interstate agreement for episode control	3-15
Interstate Agreement	August 1973	Interstate control of episodes	3-15

4. CONTROL REGULATIONS

4.1 EXISTING REGULATIONS

Currently, the State of Ohio has no control regulations. The City of Cincinnati has a set of control regulations and an active control and enforcement program. The Cincinnati Regulations were reviewed for possible adoption by the State for Ohio's portion of the MCIAQCR. It was determined that the existing regulations lacked certain desirable features. Accordingly, a set of regulations presented in the following section are proposed for adoption by the Ohio Air Pollution Control Board. The City of Cincinnati will be required to adjust its existing emission control limitations and regulatory procedures so that they are compatible with the new State regulations.

4.2 PROPOSED REGULATIONS*

PROPOSED
RULES AND REGULATIONS
STATE OF OHIO
CINCINNATI INTERSTATE AIR QUALITY CONTROL REGION

PART I
GENERAL PROVISIONS

A. PURPOSE

It is the purpose of these emission control regulations to state such requirements as shall be required to maintain or obtain reasonable levels of air quality consistent with the protection of health and the prevention of injury to plant, animal life and property in the State of Ohio, to promote the economic and social development of the State; and to provide for the comfortable enjoyment of the natural attractions of the State to the greatest extent practical.

B. SCOPE

These emission control regulations apply to any source or emission existing partially or wholly within the Cincinnati Interstate Air Quality Control Region.

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*This draft of regulations does not represent official acceptance by the State of Ohio. Administrative consideration may require redrafting. These proposed control regulations are included to indicate the general form that regulations should take.

C. AUTHORITY

The Ohio State Department of Health has been authorized to provide and administer these regulations under the provisions of Section __________ through Section __________ of Chapter __________ of the Ohio Revised Statutes.

D. DEFINITIONS

As used in these regulations, except as otherwise specifically provided or where the context indicates otherwise, the following words shall have the meanings ascribed to them in this section:

(1) "Act" shall mean Section __________ through Section __________ of Chapter _________ of the Ohio Revised Statutes.

(2) "Air contaminant" shall mean dust, fumes, mist, smoke, other particulate matter, vapor, gas, or any combination thereof.

(3) "Air pollution" shall mean the presence in the outdoor atmosphere of one or more air contaminants in such quantities and duration as to threaten or endanger or is injurious to human health or welfare, animal or plant life, or property or interferes with the enjoyment of life or property.

(4) "Ambient air" shall mean the outdoor air that envelops or surrounds the earth.

(5) "ASME" shall mean the American Society of Mechanical Engineers, 345 East 47th Street, New York, New York.

(6) "ASTM" shall mean the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania.

(7) "Control equipment" shall mean any device or contrivance which prevents or reduces emissions.

(8) "Department" shall mean the Ohio State Department of Health.

(9) "Emission" shall mean a release of air contaminants into the ambient air.

(10) "Existing" shall mean equipment, machines, devices, articles, contrivances or installations which are in being on the effective date of these regulations; except that any existing equipment, machine, device, article, contrivance or installation which is altered, replaced or rebuilt after the effective date of these regulations shall be reclassified as "new" if such alteration,

rebuilding, or repair constitutes an additional or greater source of air pollution or increases production capacity.

(11) "New" shall mean equipment, machines, devices, articles, contrivances or installations built or installed on or after the effective date of these regulations, and installations existing at said stated time which are later altered, repaired or rebuilt and constitute an additional or greater source of air pollution. Any equipment moved to another premise involving a change of address, or purchased and to be operated by a new owner, or when a new lessee desires to operate such equipment after the effecitve date of these regulations shall be considered new.

(12) "Opacity" shall mean a state which renders material partially or wholly impervious to rays of light and causes obstruction of an observer's view.

(13) "Open burning" shall mean the burning of any matter in such a manner that the products of combustion resulting from the burning are emitted directly into the ambient air without passing through an adequate stack, duct or chimney.

(14) "Particulate matter" shall mean any material, except water in uncombined form that is or has been airborne, and exists as a liquid or a solid at standard conditions.

(15) "Person" shall mean any individual, corporation, partnership, form, association, trust, estate, public or private institution, group, agency, political subdivision of this State, any other state or political subdivision or agency thereof and any legal successor, representative agent or agency of the foregoing.

(16) "Public nuisance" shall mean any condition of the ambient air beyond the property line of the offending person which is injurious to health, or offensive to the senses, or which causes or constitutes an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property.

(17) "Source" shall mean any property, real or personal, or person contributing to air pollution.

(18) "Source operation" shall mean the last operation preceding emission which operation (a) results in the separation of the air contaminant from the process materials or in the conversion of the process materials into air contaminants, as in the case of combustion fuel; and (b) is not an air pollution abatement operation.

(19) "Stack or chimney" shall mean any flue, conduit or duct arranged to conduct emissions.

(20) "Standard conditions" shall mean a dry gas temperature of 60 degrees fahrenheit (15.6 degrees centigrade) and a gas pressure of 14.7 pounds per square inch absolute (760 millimeters of mercury).

E. PERMITS AND OPERATING CERTIFICATES

(1) Construction Permits and Operating Certificates; When Required

a. No person shall cause or permit the construction, installation or alteration of equipment capable of emitting air contaminants, or control apparatus, without first obtaining a construction permit from the Director. A construction permit shall remain in effect until the operating certificate is granted or denied or the application is canceled.

b. No person shall cause or permit the use or operation of new equipment or control apparatus for which a construction permit is required without first obtaining an operating certificate from the Director.

c. No person shall cause or permit the use or operation of existing equipment or control apparatus without obtaining an operating certificate from the Director within six months of the adopted date of these regulations or an approved control plan in accordance with Section L of these regulations.

(2) A Construction Permit and Operating Certificate Shall not be Required For:

a. The installation or alteration of an air contaminant detector, air contaminant recorder, combustion controller or combustion shutoff.

b. Air conditioning or ventilating systems not designed to remove air contaminant generated by or released from equipment.

c. Fuel burning equipment, other than smoke house generators, which; uses gas as a fuel for space heating, air conditioning or heating water; or is used in a private dwelling or has a BTU input of not more than 350,000 BTU per hour; or is used for space heating, other than boilers and hot air furnaces.

d. Internal combustion engines.

e. Laboratory equipment used exclusively for chemical or physical analyses.

f. Such other sources of minor significance exempted by the Department.

(3) General Requirements for Applications for Permits and Operating Certificates

a. Application for a construction, installation or alteration permit or for an operating certificate shall be made by the owner or lessee of the equipment or control apparatus, or his agent, on forms furnished by the Department. If the applicant is a partnership or group other than a corporation, the application shall be made by one individual who is a member of the group. If the applicant is a corporation, the application shall be made by an officer of the corporation.

b. A separate application is required for each unit of equipment or control apparatus, unless identical units of equipment or control apparatus are to be installed, altered, or operated in an identical manner in the same building.

c. Each application shall be signed by the applicant, and unless waived by the Director, certified by a registered professional engineer in the State of Ohio as to the accuracy of the technical information concerning the equipment or control apparatus contained in the application plans and other papers submitted. The signature of the applicant shall constitute an agreement that the applicant will assume responsibility for the installation, alteration or use of the equipment or control apparatus concerned in accordance with the requirements of this Code.

d. The Director shall not issue a construction permit or operating certificate unless on the basis of the application and other papers submitted, he is satisfied that the provisions of this Code will be met.

(4) Information Required for Applications for Permits

a. Each application for an installation or alteration permit shall be accompanied by copies of the plans which shall be of professional quality. Except in the case of an application for a permit to install or alter experiemental equipment to control apparatus, the application and the plans shall clearly show and describe in detail the following:

1. The equipment or control apparatus covered by the application; and

2. Any equipment connected or attached to, or serving or served by the unit of equipment or control apparatus covered by the application, unless an application and plans for the equipment are on file with the Department and the information contained therein is up-to-date; and

3. The plot plan, including the distance and height of buildings within a reasonable distance from the place where the equipment is or will be installed, unless an up-to-date plot plan is on file with the Department; and

4. The proposed means for the prevention or control of the emission of air contaminant; and

5. Any additional information, evidence or documentation required by the Department to show what the proposed control apparatus will achieve.

b. The application and plans for the installation or alteration of the experimental equipment or control apparatus shall contain as much of the information described by subsection (a) as is available. Complete information shall be filed before an operating certificate is issued.

c. Information concerning secret processes which may be required, ascertained or discovered by the Department shall not be disclosed by any Departmental employee, except that the information may be disclosed by the Director if the Department is subpoenaed for the information or if in the course of a court proceeding or Department hearing the information is relevant to the proceeding or hearing.

(5) Standards for Granting Permits

Except as provided in Section (6), no construction permit shall be granted unless the applicant shows to the satisfaction of the Director that:

a. The equipment is designed and will be installed or altered to operate without causing a violation of the provisions of the rules and regulations; and

b. The equipment incorporates advances in the art of air pollution control developed for the kind and amount of air contaminant emitted by the applicant's equipment; and

c. Equipment which will have a stack or duct 3 feet or more in diameter, will be provided with:

1. Sampling ports of a size, number and location as the Department may require, and
2. Safe access to each port, and
3. Such other sampling and testing facilities as the Department may require; and

d. Fuel burning equipment and refuse burning equipment will achieve optimum combustion of the fuel or refuse material to be burned. In order to assure optimum combustion, the equipment shall be large enough to handle the planned load, have a means to regulate the quantity, distribution and flow of air into the combustion chamber, and have a means to achieve and maintain the proper temperature for the optimum combustion of the particular type of fuel or refuse material to be burned; and

e. Fuel burning equipment which will use residual fuel oil will be installed with an air contaminant detector and combustion shutoff or a combustion controller; and

f. All parts of the equipment can be readily cleaned or repaired.

(6) Conditional Approval of Permits

The Director may grant a construction permit for an experimental installation or alteration on conditional approval if it appears likely from all of the information submitted that the installation or alteration when completed may satisfy the rules and regulations.

(7) Cancellation of Permits

a. The Director may cancel a construction permit if the installation or alteration is not begun within one year from the date of the issuance of the permit or if the work involved in the installation or alteration is suspended for one year or more from the date of the issuance of the permit.

b. An applicant may secure an extension of the expiration date by written request to the Director stating the reasons for the request. Extensions may be granted for a period of not more than six months.

(8) Standard for Granting Operating Certificates

No operating certificate shall be granted unless the applicant shows to the satisfaction of the Director that the equipment or control apparatus satisfies the requirements of the regulations and is constructed, installed or altered in accordance with the requirements and conditions contained in the construction permit.

(9) Testing Before Granting of Operating Certificate

a. Before an operating certificate is granted, the Director may require the applicant to conduct tests to determine the kind or amount of the air contaminant emitted from the equipment or to determine whether the fuel used is as specified on the permit and is suitable for the equipment. The test shall be made at the expense of the applicant.

(10) Action on Applications for Operating Certificates and Permits

a. The Director shall act within a reasonable time on an application for a construction permit or for an operating certificate, and shall notify the applicant in writing of his approval, conditional approval or denial of the application.

b. If an application is denied, the Director shall set forth his objections in the notice of denial.

c. The applicant may request the Director to reconsider the application by answering in writing the Director's objections to the application.

d. The Director will consider the applicant's answer to his objections, and shall notify the applicant in writing within a reasonable time of his approval or denial of the application.

e. Before acting on an application for a construction permit or operating certificate, the Director may require the applicant to furnish further information or further plans or specifications.

f. The applicant may at his option deem the construction permit or operating certificate denied if the Director fails to act on the application within 30 days after filing, or within 30 days after applicant furnishes the further information, plans and specifications requested by the Director, whichever is later.

(11) Conditions of Operating Certificate to be Observed

The holder of an operating certificate shall comply with the conditions contained in his certificate as well as all applicable provisions of the rules and regulations.

(12) Suspension or Revocation of Operating Certificates

a. The Director may suspend or revoke an operating certificate for willful or continued violation of the rules and regulations.

b. Suspension or revocation of an operating certificate shall become final 10 days after service of notice on the holder of the certificate.

(13) Denial, Suspension or Revocation of Construction Permits or Operating Certificates

a. When the Director denies suspends or revokes a construction permit or operating certificate the aggrieved person affected thereby may request a public hearing by the Board to reconsider this action by filing a petition for reconsideration within 10 days following the service of the notice of denial, suspension or revocation.

b. The petition shall be addressed to the Director and shall contain:

1. The full name of the person making the request.
2. The location of the equipment or control apparatus listed in the operating certificate to which the request relates; and
3. The date of the issuance of the certificate, and the date of the action taken by the Director and the nature of the action; and
4. A statement that a hearing by the Board to reconsider the action of the Director is requested and;
5. The signature of the person making the request, or if such person is not an individual, the signature and title of a partner or other individual of the partnership or group or of an officer of the corporation.

c. The Board, after notice and a public hearing held within 30 days after filing the petition, may sustain or reverse the action of the Director; such order may be made subject to specified conditions.

(14) Surrender of Permits and Operating Certificates

A construction permit or operating certificate which has been revoked pursuant to these regulations shall be surrendered forthwith to the Department.

(15) Transfer of Construction Permits and Operating Certificates

Any purported or attempted transfer of a construction permit to a person not named therein as permittee, or any purported or attempted transfer of a construction permit or of an operating certificate from one location to another or from one piece of equipment to another automatically revokes the permit or the certificate.

F. SUBMISSION OF EMISSION INFORMATION

The Director may require the submission of air pollutant information, from any or all potential sources for purposes of maintaining an air pollutant emission inventory. Such information shall be provided on forms furnished by the Department.

G. MEASUREMENT OF EMISSIONS OF AIR CONTAMINANTS

(1) The Director may require any person responsible for emission of air contaminants to make or have made tests to determine the emission of air contaminants from any source in order to obtain an operating certificate or whenever the Department has reason to believe that an emission in excess of that allowed by these regulations is occurring. The Department may specify testing methods to be used in accordance with good professional practice. The Department may observe the testing. All tests shall be conducted by reputable, qualified personnel. The Department shall be given a copy of the test results in writing and signed by the person responsible for the tests.

(2) The Director may conduct tests of emissions of air contaminants from any source. Upon request of the Department the person responsible for the source to be tested shall provide necessary holes in stacks or ducts and such other safe and proper sampling and testing facilities, exclusive of instruments and sensing devices as may be necessary for proper determination of the emission of air contaminants.

(3) The Director shall have the authority to install or order any person or owner to install monitoring equipment or devices at the expense of such person or owner on any premise in order to determine the quantity and quality of air contaminants emitted into the open air.

H. CONTROL PLAN COMPLIANCE SCHEDULE

Except as otherwise specified, compliance with the provisions of these regulations shall be according to the following time schedule:

(1) New Installations

All new installations shall comply as of going into operation.

(2) Existing Instllations

All existing installations not in compliance as of the effective date of these regulations shall be in compliance within eighteen months of the effective date of these regulations unless the owner or person responsible for the operation of the installation shall have submitted to the Department in a form and manner satisfactory to it, a control plan and schedule for achieving compliance, such plan and schedule to contain a date on or before which full compliance will be attained, and such other information as the Department may require. If approved by the Department, such date will be the date on which the person shall comply. The Department may require persons submitting such a plan to submit subsequent periodic reports on progress in achieving compliance., In no event shall the control plan and schedule exceed two and one half years from the adopted date of these regulations.

I. AIR POLLUTION NUISANCES PROHIBITED

(1) No person shall cause or permit the discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any person or to the public or which endanger the comfort, repose, health, or safety of any such person or the public or which cause injury or damage to business or property

(2) Nothing in any part of these regulations concerning emission of air contaminants or any other regulation relating to air pollution shall in any manner be construed as authorizing or legalizing the creation or maintenance of a nuisance as described in _________.

J. CIRCUMVENTION

No person shall cause or permit the installation or use of any device of any means which, without resulting in reduction in the total amount of air contaminant emitted, conceals or dilutes an emission of air contaminant which would otherwise violate these regulations.

K. SEVERABILITY

If any provision of these regulations or the application thereof to any person or circumstances is held to be invalid, such invalidity shall not affect other provisions or application of any other part of these regulations which can be given effect without the invalid provisions or application, and to this end the provisions of these regulations and the various applications thereof are declared to be severable.

PART II
RESTRICTION OF EMISSION OF VISIBLE AIR CONTAMINANTS

A. VISIBLE EMISSION RESTRICTIONS

(1) No person shall discharge into the atmosphere from any single source of emission whatsoever any air contaminant of a shade or density equal to or darker than that designated as No. 1 on the Ringelmann Chart, or

(2) Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subsection A (1) of this regulation.

(3) A person may discharge into the atmosphere from any single source of emission for a period or periods aggregating not more than five minutes in any sixty minutes air contaminants of a shade or density not darker than No. 2 on the Ringelmann Chart until January 1, 1972.

(4) Of such opacity as to obscure an observer's view to a degree not greater than does smoke described in subsection B (1) of this regulation.

B. VISIBLE EMISSIONS FROM INTERNAL COMBUSTION EQUIPMENT

No person shall cause or permit the emission of visible air contaminants for the internal combustion engine of:

(1) Portable or stationary equipment for longer than 10 consecutive seconds; or

(2) A motor vehicle while the vehicle is stationary for longer than 10 seconds; or

(3) A motor vehicle after the vehicle has moved more than 100 yards from a place where the vehicle was stationary.

C. UNCOMBINED WATER

Where the presence of uncombined water is the only reason for failure of an emission to meet the requirements of section "A" or "B" of this regulation, such sections shall not apply.

PART III
OPEN BURNING PROHIBITED

A. REFUSE BURNING RESTRICTIONS

(1) No person shall dispose of refuse or other waste material by open burning, or cause, suffer, allow, or permit open burning of refuse or other waste material.

(2) In areas where no public or commercial refuse collection service is available by the effective date of this regulation, the open burning of refuse on residential premises or of refuse orginating in dwelling units on the same premises shall not be in violation of this regulation until such refuse collection service becomes available or until 3 years from the effective date of this regulation, whichever is sooner.

B. PROHIBITION OF SALVAGE OPERATIONS BY OPEN BURNING

No person shall conduct or cause or permit the conduct of a salvage operation by open burning.

PART IV
RESTRICTION OF EMISSION OF FUGITIVE DUST AND GASES

A. No person shall cause or permit the handling or transporting or storage of any material in a manner which allows or may allow unnecessary amounts of particulate matter to become air-borne.

B. No person shall cause or permit a building or its appurtenances or a road, or a driveway, or an open area to be constructed, used, repaired or demolished without applying all such reasonable measures as may be required to prevent particulate matter from becoming air-borne. The Director may require such reasonable measures as may be necessary to prevent particulate matter from becoming air-borne including but not limited to paving or frequent cleaning of roads, driveways and parking lots; application of dust-free surfaces; application of water; and the planting and maintenance of vegetative ground cover.

C. When dust, fumes, gases, mist, odorous matter, vapors, or any combination thereof escape from a building or equipment in such manner and amount as to cause a nuisance or to violate any regulation, the Director may order that the building or equipment in which processing, handling and storage are done be tightly closed and ventilated in such a way that all air and gases and air or gas-borne material leaving the building or equipment are treated by removal or destruction of air contaminants before discharge to the open air.

PART V
RESTRICTION ON EMISSIONS FROM INCINERATORS

A. GENERAL PROVISIONS

(1) This regulation shall apply to any incinerator used to dispose of refuse or other wastes by burning and the processing of salvable material by burning. Notwithstanding definitions in other regulations, as used in this regulation the word refuse includes garbage, rubbish, trade wastes, leaves, salvable material, agricultural wastes, and other wastes. The word incinerator, as used in this regulation, includes incinerators and other devices, structures, or contrivances used to burn refuse (as defined herein) or to process refuse by burning.

(2) The burning capacity of an incinerator shall be the manufacturer's or designer's guaranteed maximum rate or such other rate as may be determined by the Director in accordance with good engineering practices. In case of conflict, the determination made by the Director shall govern.

(3) The amount of particulate matter emitted from any incinerator shall be determined according to the National Air Pollution Control Administration publication, "Specifications for Incinerator Testing at Federal Facilities" which publication is made part of this regulation be reference.

(4) For the purposes of this regulation the total of the capacities of all furnaces within one system shall be considered as the incinerator capacity.

B. EMISSION LIMITATIONS

(1) No person shall cause, suffer, or allow to be emitted into the open air from any incinerator, air contaminants the appearance, density, or shade of which exceed No. 1 of the Ringelmann Chart, or an equivalent opacity.

(2) No person shall cause, suffer, or allow to be emitted into the atmosphere from any incinerator or to pass a convenient measuring point near the stack outlet, fly ash in the gases to exceed 0.20 pounds per 100 pounds per hour of rated capacity.

C. DESIGN-OPERATION REQUIREMENTS

(1) No residential or commercial single-chamber incinerator shall be used for the burning of refuse for a period in excess of eighteen (18) months after the adopted date of this regulation.

(2) All new incinerators and all existing incinerators after January 1, 1972 shall be multiple-chamber incinerators, provided that the Director may approve any other type of incinerator if he finds that the emissions do not exceed those allowed in this regulation.

(3) No person shall operate or cause or permit the operation of any incinerator at any time other than between the hours of 10:00 A.M. and 4:00 P.M. This restriction shall not apply to incinerators having a refuse-burning capacity of five (5) tons per hour or more.

(4) Incinerators, including all associated equipment and grounds, shall be designed, operated and maintained so as to prevent the emission of odors.

PART VI
RESTRICTION ON EMISSION OF PARTICULATE MATTER FROM FUEL BURNING EQUIPMENT

A. GENERAL PROVISIONS

(1) This regulation applies to installations in which fuel is burned for the primary purpose of producing heat or power by indirect heat transfer. Fuels include those such as coal, coke, lignite, coke breeze, fuel oil, and wood but do not include refuse. When any products or by-products of a manufacturing process are burned for the same purpose or in conjunction with any fuel, the same maximum emission limitations shall apply.

(2) The heat content of coal shall be determined according to ASTM method D-271-64 Laboratory Sampling and Analysis of Coal or Coke or ASTM method D-21-5-62T Gross Calorific value of Solid Fuel by the Adiabatic Bomb Calorimeter, which publications are made a part of this section by reference.

(3) For purposes of this regulation the heat input shall be the aggregate heat content of all fuels whose products of combustion pass through a stack or stacks. The heat input value used shall be the equipment manufacturer's or designer's guaranteed maximum input, whichever is greater. The total heat input of all fuel burning units on a plant or premises shall be used for determing the maximum allowable amount of particulate matter which may be emitted.

(4) The amount of particulate matter emitted shall be measured according to the American Society of Mechanical Engineer's Power Test Codes - PTC-27 dated 1957 and entitled Determining Dust

Concentrations in a Gas Steam, which publication is made a part of this section by reference.

B. EMISSION LIMITATIONS

(1) No person shall cause or permit the emission of particulate matter, caused by combustion of fuel in fuel-burning equipment, from any stack or chimney in excess of the quantity set forth in the following Figure 1.

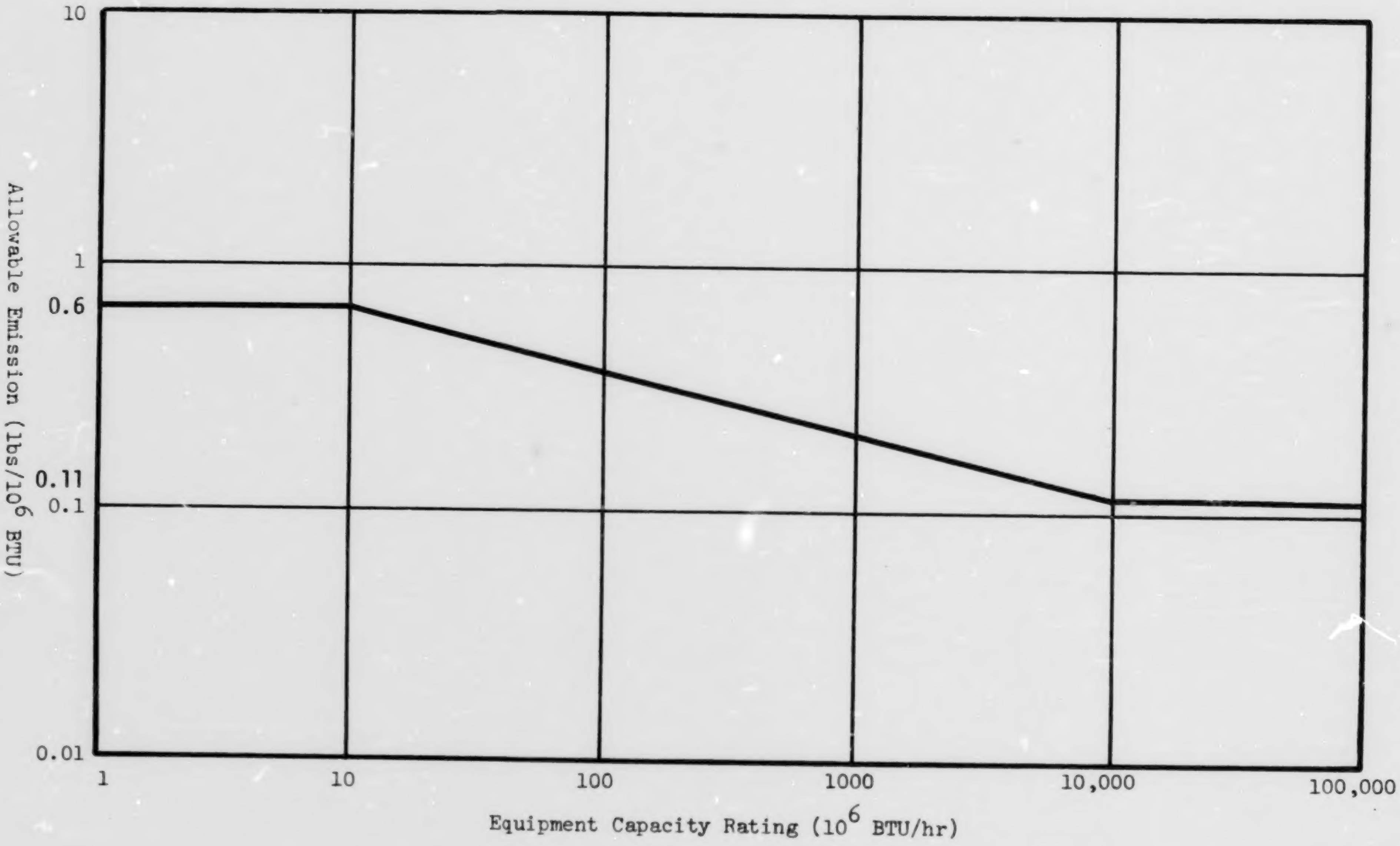


Figure 1. Allowable Particulate Emissions from Fuel Combustion for Indirect Heating.

PART VIII

RESTRICTION OF EMISSIONS OF SULFUR DIOXIDE FROM USE OF FUEL

A. GENERAL PROVISIONS

(1) This regulation shall apply to any installation in which fuel is burned and in which the sulfur dioxide emission is largely due to the content of the fuel burned, and in which the fuel is burned primarily to produce heat or power by indirect heat transfer.

(2) For purposes of the regulation, a fuel-burning installation is any single fuel-burning furnace or boiler or other unit, device, or contrivance in which fuel is burned or any grouping of two or more such furnaces or boilers or other units, devices, or contrivances on the same premises or otherwise located in close proximity to each other and under control of the same person. The capacity of such installations shall be the manufacturer's or designer's guaranteed maximum heat input rate.

(3) The method for determining the percent of sulfur in coal shall be that described in ASTM D-271-64, Standard Methods of Laboratory Sampling and Analysis of Coal and Coke or equivalent method approved by the Director. The method for determining the heat content of coal shall be described in ASTM D-271-74, Standard Methods of Laboratory Sampling and Analysis of Coal and Coke or D-2015-62T, Tentative Method of Test for Gross Calorific Value of Solid Fuel by the Adiabatic Bomb Calorimeter. All coal analyses and heat

contents are to be made on a dry basis. Moisture content of coal is to be determined in all cases and results reduced to facilitate calculations of actual pollutants. The method for determining the sulfur content of fuel oil shall be that described in ASTM D-129-64 Standard Method of Test for Sulfur in Petroleum Products by the Bomb Method. The method for determining the heat content of fuel oil shall be that described in ASTM D-240-64 Standard Method of Test for Heat of Combustion of Liquids by Bomb Calorimeter or other method giving comparable results. The testing methods specified in the subsection A (3) are hereby made a part of this regulation, by reference.

(4) The Director is authorized to take samples of any fuel by any appropriate means for the sampling of the quantity which he finds, at any reasonable time or place, for purposes of determining compliance with this regulation. Where applicable, the following methods will be used.

For coal: ASTM: D-492-48 (1958), Standard Method of Sampling Coals Calssified According to Ash Content

ASTM: D-2013-64T, Tentative Method of Preparing Coal Samples for Analysis

ASTM: D-2234-65T, Tentative Method for Mechanical Sampling of Coal

For oil: ASTM: D-270-64, Standard Method of Sampling Petroleum and Petroleum Products

B. PROHIBITIONS

(1) No person shall burn, sell or make available for sale for burning in fuel burning equipment, any fuel containing in excess of 1% sulfur by weight after July 1, 1971 except for fuel combustion units having heat capacities in excess of 200 million BTU/hr; for these units fuel in excess of 1.25% sulfur by weight are prohibited.

(2) Any person offering to sell or deliver fuel or any person responsible for fuel burning equipment, shall, upon request, submit to the Department such analyses of the fuel as may be required to determine compliance with these regulations.

(3) It shall be unlawful for any person to import, sell, offer for sale, expose for sale, exchange, deliver or transport for use and consumption in the State of Ohio or to use or consume in the State of Ohio any fuel which does not meet the requirements of this regulation.

(4) Fuels in excess of the limits set out in B(1) above may be burned, sold or made available for sale for burning in fuel burning equipment on which control equipment to desulfurize stack gases has been installed or other methods or devices are used that will produce results equivalent to those that would have resulted from the burning of fuel containing one percent or less sulfur by weight without these added control features and for which approval for use has been obtained from the Director.

PART VII
RESTRICTION OF EMISSION OF PARTICULATE MATTER FROM INDUSTRIAL PROCESSES

A. GENERAL PROVISIONS

(1) This regulation applies to any operation, process, or activity from which particulate is emitted except (a) the burning of fuel for the primary purpose of producing heat or power by indirect heating in which the products of combustion do not come into direct contact with process materials, (b) the burning of refuse, and (c) the processing of salvable material by burning.

(2) Process weight per hour is the total weight of all materials introduced into any specific process that may cause any discharge of particulate matter. Solid fuels charged will be considered as part of the process weight, but liquid and gaseous fuels and combustion air will not. For a cyclical or batch operation, the process weight per hour will be derived by dividing the total process weight by the number of hours in one complete operation from the beginning of any given process to the completion thereof, excluding any time during which the equipment is idle.. For a continuous operation, the process weight per hour will be derived by dividing the process weight for a typical period of time. Where the nature of any process or operation or the design of any equipment is such as to permit more than one interpretation of this definition, the interpretation that results in the minimum value for allowable emission shall apply.

(3) Emission tests relating to this regulation shall be made following the standards in The American Society of Mechanical Engineers "Power Test Codes 11 - PTC-27," dated 1957, and entitled, "Determining Dust Concentration in a Gas Stream," or as modified by the Director to suit specific sampling needs or conditions.

(4) For purposes of the regulation, the total process weight from all similar process units at a plant or premises shall be used for determining the maximum allowable emission of particulate matter that passes through a stack or stacks.

(5) For purposes of this regulation the process weight rate shall be the equipment manufacturer's or designer's guaranteed maximum input, whichever is greater.

B. EMISSION LIMITATIONS

(1) No person shall cause, suffer, allow, or permit the emission of particulate matter in any 1 hour from any source in excess of the amount shown in the following table for the process weight allocated to such source.

TABLE . B-1

Process Weight Rate	Rate of Emission	Process Weight Rate	Rate of Emission
Lb/Hr	Lb/Hr	Lb/Hr	Lb/Hr
100	0.551	16,000	16.5
200	0.877	18,000	17.9
400	1.40	20,000	19.2
600	1.83	30,000	25.2
800	2.22	40,000	30.5
1,000	2.58	50,000	35.4
1,500	3.38	60,000	40.0
2,000	4.10	70,000	41.3
2,500	4.76	80,000	42.5
3,000	5.38	90,000	43.6
3,500	5.96	100,000	44.6
4,000	6.52	120,000	46.3
5,000	7.58	140,000	47.8
6,000	8.56	160,000	49.0
7,000	9.49	200,000	51.2
8,000	10.4	1,000,000	69.0
9,000	11.2	2,000,000	77.6
12,000	13.6	6,000,000	92.7

(2) Interpolation of the data in this table for process weight rates up to 60,000 lb/hr shall be accomplished by use of the equation $E = 4.10 P^{0.67}$, and interpolation and extrapolation of the data for process weight rates in excess of 60,000 lb/hr shall be accomplished by use of the equation: $E = 55.0 P^{0.11-40}$, where E - rate of emission in lb/hr and P = Process weight rate in tons/hr.

PART IX
RESTRICTION ON EMISSION OF SULFUR OXIDES FROM INDUSTRIAL PROCESSES

A. GENERAL PROVISIONS

(1) The method of measuring sulfur oxides in stack gases shall be the Shell Development Company method as published in "Atmospheric Emissions from Sulfuric Acid Manufacturing Processes." Public Health Service Publication 999-AP-13. Appendix B, 85-7 which publication is made a part of this regulation by reference.

(2) The method of measuring sulfur trioxide, sulfuric acid, or any combination thereof in stack gases shall be the modified Monsanto Company method as published in "Atmospheric Emissions from Sulfuric Acid Manufacturing Processes." Public Health Service Publication 999-AP-13. Appendix B, 61-6 which publication is made part of this regulation by reference.

(3) Other test methods approved by the Director may be used.

B. CONCENTRATION OF SULFUR COMPOUNDS IN EMISSIONS RESTRICTED

(1) No person shall cause or permit the emission of sulfur oxides into the atmosphere from any existing sulfuric acid plant exceeding 36 pounds and from any new sulfuric acid plant exceeding 9 pounds per ton of acid (98%) produced, respectively.

(2) No person shall cause or permit the emission into the atmosphere from any sulfuric acid plant of acid mist exceeding 0.5 pounds per ton of acid (98%) produced.

(3) No person shall cause or permit the emission into the atmosphere of gases containing more than 2000 parts per million of sulfur oxides by volume.

5. EMERGENCY EPISODE AUTHORITY AND PROCEDURES

The purpose of an Emergency Episode Plan is to prevent the ambient concentrations of pollutants from ever reaching levels where it appears that the health, safety, and welfare of the community may be in danger. The objective of this Emergency Episode Plan is to temporarily control sources within the Ohio portion of the MCIAQCR during episode periods when dilution is not adequate to prevent high ground level concentrations of pollutants. Planning for emergency episodes assures that reduction of emission from sources is conducted in a well-structured manner with minimum inconvenience to the emitters as well as the citizens of Ohio.

The Emergency Episode Plan is presented in the following sections. The Plan is designed for the emergency control of particulates and sulfur oxides. Emergency episode plans for other pollutants such as carbon monoxide, oxidants, and nitrogen oxides will be submitted to the Secretary of the Department of Health, Education and Welfare later.

The proposed Emergency Episode Plan is viewed as a mechanism that will eventually be sensitive to all air contaminants which may be hazardous to human health during episodes. This is to say, the Plan that is outlined for development is designed with an awareness of the future requirements of the State. The intensity of study which supports the development of the proposed Plan is justified on the grounds that the emergency control of pollutants, in addition to particulates and sulfur oxides, will be eventually coordinated by one common Plan.

5.1 COMPREHENSIVE EMERGENCY EPISODE PLAN

The comprehensive Emergency Episode Plan is an outline of the steps that will be taken by Ohio to establish a viable episode organization. The plan is based on the MCIAQCR episode organization as presented in Appendix C of this report. Since episodes are regional problems, cooperation among the jurisdictions in the MCIAQCR will be mandatory. The utilization of the MCIAQCR EOCC* will assist the cooperative effort.

The comprehensive Plan is viewed as an outgrowth of the interim Plan which is presented in Section 5.2. The interim Plan calls for a number of specific actions which are recommended for episode avoidance. The

* Emergency Operations Control Center

comprehensive Plan, once developed, will replace parts of the interim Plan with an approach which is based on scientific and engineering fact. The comprehensive Plan will provide for intensive evaluation of emission sources as well as an air quality and meteorological parameters to insure sensitivity to the needs of the Ohio portion of the MCIAQCR.

5.1.1 Episode Criteria

The following episode criteria will trigger preplanned emergency actions in the Ohio portion of the MCIAQCR:

1. Status: "Forecast" - An internal watch will be activated on the basis of a Weather Bureau HAPPA* or equivalent indication that a high air pollution potential will exist for the next 36 hours.

2. Status: "Alert" - At the initiation of, and periodically during a "Forecast" period, air quality information for the preceding 24-hour period will be reviewed. If for any consecutive 24-hour period the average sulfur dioxide level is equal to or exceeds 0.10 ppm and the soiling index for the same period is equal to or exceeds 2.0 COHs an "Alert" status is established.

3. Status: "Warning" - If for any consecutive 24-hour period during an "Alert", the average sulfur dioxide level is equal to or exceeds 0.25 ppm and the soiling index for the same period is equal to or exceeds 4.0 COHs, a "Warning" status is established.

4. Status: "Emergency" - If during the "Warning" period, it appears imminent that for a 24-hour period the average sulfur dioxide level will equal or exceed 0.40 ppm and the soiling index for the same period will equal or exceed 6.0 COHs, an "Emergency" status is established.

5. Status: "Termination" - Once declared, any status reached by application of these criteria will remain in force until the criteria for that status are no longer met. At such time, the next lower status will be resumed. This procedure will continue until the episode is terminated.

Emergency actions will be taken by each state when any monitoring site within the MCIAQCR records ambient air quality in excess of that designated in the criteria. Adverse air quality need not be regionwide to trigger emergency control actions. Also, the Alert, Warning, and Emergency stages can and should be activated on the basis of deteriorating air quality alone; a High Air Pollution Potential Advisory need not be in effect.

* High Air Pollution Potential Advisory

The entire Emergency Episode Plan operates around the relationship between the measured air quality during the episode and the predetermined levels established by the episode criteria. The relationship between criteria and the remainder of the Plan is illustrated in Figure 5-1.

5.1.2 Episode Communications

Ohio, as a member of the Air Pollution Control Officers (APCO) Committee, will actively participate in MCIAQCR episode activities through the EOCC, the field inspection program and the State air pollution officials will be in direct contact with the organizations listed in Table 5-1.

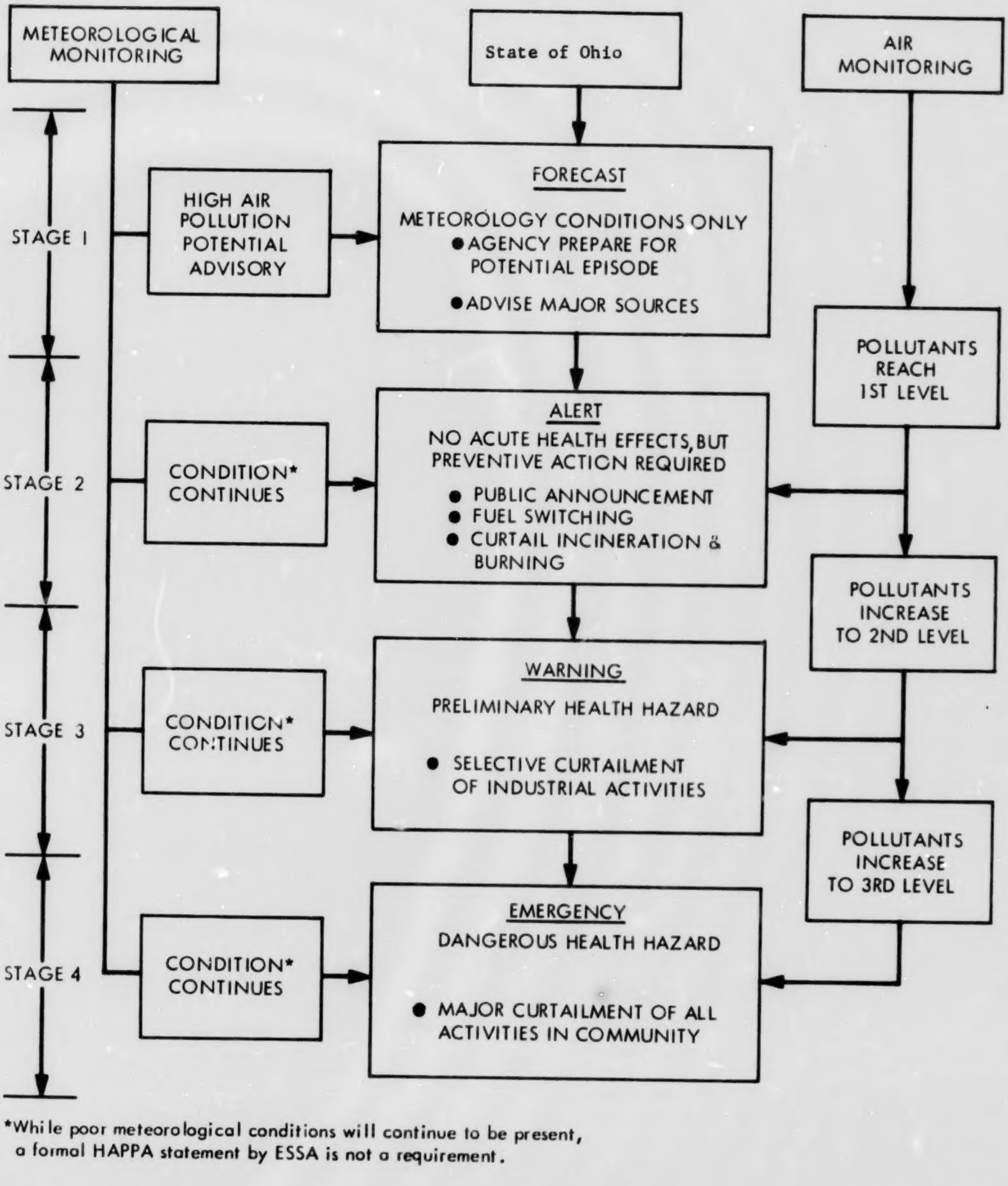
Table 5-1. ORGANIZATIONS CONTACTED DURING EPISODES

- Legal Authority
- Emission Sources
- Air Quality Data Sources
- Meteorological Data Sources
- NAPCA
- Neighboring Jurisdictions
- Other State and Local Governmental Departments
- News Media
- Hospitals
- Telephone Company

5.1.2.1 Communications Center

The objective of the MCIAQCR EOCC is to serve as the facility for reception and processing of data relating to air pollution episodes and for determination of avoidance actions. It will accept information, process raw information into intelligence data, and determine corrective actions. The implementation of specific source control actions will be left to the individual states.

During air pollution episodes, the MCIAQCR EOCC will be manned by the staff of the City of Cincinnati and personnel from the state agencies in Ohio, Kentucky, and Indiana. Other specialists such as physicians may also be called upon to volunteer their services during the serious stages of episodes. In general, they will recommend appropriate actions as well as assist in the interpretation of air quality data, meteorological factors, public health effects, and engineering considerations.


METEOROLOGICAL MONITORING
State of Ohio
AIR MONITORING
STAGE 1
HIGH AIR POLLUTION POTENTIAL ADVISORY
FORECAST
METEOROLOGY CONDITIONS ONLY
● AGENCY PREPARE FOR POTENTIAL EPISODE
● ADVISE MAJOR SOURCES
POLLUTANTS REACH 1ST LEVEL
STAGE 2
CONDITION* CONTINUES
ALERT
NO ACUTE HEALTH EFFECTS, BUT PREVENTIVE ACTION REQUIRED
● PUBLIC ANNOUNCEMENT
● FUEL SWITCHING
● CURTAIL INCINERATION & BURNING
POLLUTANTS INCREASE TO 2ND LEVEL
STAGE 3
CONDITION* CONTINUES
WARNING
PRELIMINARY HEALTH HAZARD
● SELECTIVE CURTAILMENT OF INDUSTRIAL ACTIVITIES
POLLUTANTS INCREASE TO 3RD LEVEL
STAGE 4
CONDITION* CONTINUES
EMERGENCY
DANGEROUS HEALTH HAZARD
● MAJOR CURTAILMENT OF ALL ACTIVITIES IN COMMUNITY

*While poor meteorological conditions will continue to be present, a formal HAPPA statement by ESSA is not a requirement.

Figure 5-1. OHIO EPISODE SEQUENCE

The staff requirements for episode actions under the comprehensive Episode Plan will be similar to the staff identified for the interim Plan in Table 5-5. All of the staff, except for the technicians, field inspectors, and enforcement personnel (who have field responsibilities) will report to the EOCC when so directed. Staffing schedules will be determined by the APCO Committee so that the Center will be manned on a 24-hour basis during the more severe stages of an episode. During each episode, a team will be selected to prepare a post-episode report. This team will coordinate with NAPCA in preparing such a document.

Nearly all communications will be conducted over standard telephone lines. Dedicated telephone lines may be installed to assure communications with such organizations as: major source of pollution, ESSA, and NAPCA. Such channels may be required because of the heavy load that will be placed on the regular telephone system during episodes.

A fleet of two-way radio equipped automobiles will be needed for air quality inspection, source inspection, and enforcement to maintain continuous contact with the field and to assure adequate surveillance of the emergency conditions.

Equipment needed in the EOCC in addition to standard items such as conference tables, typewriters, and calculators include wall charts and maps for display of:

- Air Quality Data
- Meteorological Information
- Source Control Data
- Traffic Flow Patterns

Essential equipment for the EOCC will be purchased and installed according to the time schedule presented in Section 5.1.6.

5.1.2.2 Communications Manual

A Communications Manual will be developed to simplify the procedure of communicating with the organizations listed in Table 5-1. The Manual will specify the operations to be followed by each member of the EOCC operating staff at each episode stage. The Manual will also identify the steps tc be taken by the field personnel.

A series of prepared press releases will be included in the Manual for immediate release during the early stages of an episode. Procedures for publicizing these messages and other specially prepared announcements will be clearly presented.

The Communications Manual will be completed by July 1971.

5.1.3 Episode Surveillance

5.1.3.1 Air Quality Monitoring

During episodes, short-period averages of air quality measurements will be available from four fixed stations described in Section 6.1.1. Three of these sites are in Ohio and one in Kentucky. Initially, only the existing CAMP station located near downtown Cincinnati will be in operation; but all four should be operative by September 1, 1971, the season of greatest episode probability.

Continuous sulfur dioxide analyzers at each site will permit averages to be obtained for sampling periods as short as 15 minutes and running sums, averages, or combined indices over longer periods as required, updated hourly.

Tape Samplers will be used to provide soiling measurements at all sites. They will be equipped with recorders for real-time measurements and easier retrospective analysis. Normal sequential sampling interval is two hours; however, the sampling time will be reset for hourly or half-hourly intervals when ambient concentrations are high.

Concentrations of suspended particulates will be measured by hi-vol samplers, one at each station. During non-episode periods, hi-vols will be set to take a midnight-to-midnight reading on a schedule of operation yet to be determined. One schedule under consideration calls for hi-vol operation every third day. However, during episodes hi-vols will be operated at maximum frequency consistent with the work load.

5.1.3.2 Meteorological Monitoring

During episode periods, both predictive and observational weather information may be required. The revised Federal Mesometeorological Plan developed by the U.S. Environmental Science Services Administration (ESSA) provides for the establishment of an ESSA Meteorological

Support Unit (EMSU) for the MCIAQCR. This unit consists of an urban (air pollution) meteorologist, a technical assistant, and two technicians. The technicians normally take two low level soundings a day, one near daybreak and one early in the afternoon near the time of maximum mixing height. During episodes one or two additional soundings may be taken.

Low level soundings provide vertical profile data on temperature and wind and derivative data such as mixing height, transport wind, and ventilation index. They differ from ordinary rawinsonde observations in that they utilize a slow-rising balloon to allow high resolution and terminate at 10,000 feet. An observational site for taking low level soundings has not yet been determined. Sites that are representative of urban conditions are preferred to the airport sites used for ordinary rawinsonde.

The target date for EMSU implementation is during fiscal year 1972. However, shortage of funds and qualified manpower has resulted in long delays in establishing EMSU units at many designated regions. As an interim arrangement, therefore, meteorological support will be provided by the existing Weather Bureau facility at Greater Cincinnati Airport, located in Boone County, Kentucky. This office is directed to establish close working relations with air pollution control agencies and related interests in the metropolitan Cincinnati area. Since the present office is responsible for the full spectrum of weather services to the community as well as support to aviation, it lacks the resources for a complete service to air quality control activity such as the EMSU specialists can provide. However, as a minimum the Weather Bureau office will furnish observational data and up-to-the-minute local advisories adapted from the High Air Pollution Potential Advisory(HAPPA), which is issued by the National Meteorological Center (NMC) at Suitland, Maryland.

The HAPPA message is disseminated over Teletype Service C daily at 12:20 E.S.T. The criteria for issuing an advisory are so restrictive, particularly with regard to a minimum size for the affected area, that local communities may not be alerted by this means against limited incidents of high pollutant concentrations. Hence, service that is tailored to the needs of the Region will go beyond mere adaptation of HAPPA messages. As a first step, arrangements will be made to have a daily air pollution potential sheet prepared by the Weather Bureau at Greater Cincinnati Airport, and the data routinely telephoned to the Cincinnati Division of Air Pollution Control or to a specified coordinating office such as the Cincinnati Regional Office of the State of Ohio control agency. Data will be adapted from the 7:00 a.m. rawinsonde run taken at Wright-Patterson Air Force Base, Dayton, which is the closest reporting station for upper air temperature and wind data. When air pollution measurements reach or are expected to reach specified levels, the receiving office will relay the meteorological data and other pertinent information to the State agencies of Indiana, Ohio, and Kentucky. A sample informational sheet is shown in Figure 5-2.

When the EMSU unit becomes operative, it will take over the responsibility for preparing, disseminating, and applying the daily air pollution potential sheet. Furthermore, the HAPPA program is expected to be decentralized, so that advisories will be better geared to local situations. Under this new arrangement, advisories for the MCIAQCR will originate from the Cleveland, Ohio Forecast Office.

In addition to the low level soundings that the EMSU unit will provide, pilot balloon ascents are made at the Greater Cincinnati Airport and at Standiford Field, Louisville, Kentucky, at 0100 and 1300 E.S.T. Observational data from Louisville are often indicative of conditions in the Cincinnati area a few hours in advance. During episodes, surface data from the following locations may also be useful:

- Lunken Airport
- Abbe Observatory(now operated by University of Cincinnati)
- MCIAQCR Surveillance Network: four Primary Stations (See section 6.1.1.)

One or more developmental types of instrumentation such as the radiothermosonde (scanning radiometer) and acoustical soundings may become operative in the near future.

FIGURE 5-2

DAILY ADVISORY FROM WEATHER BUREAU
AT GREATER CINCINNATI AIRPORT

Date ____________ ______

AIR POLLUTION POTENTIAL SHEET

I. Temperatures (^{o}F)	URBAN	RURAL
a. Maximum yesterday	________	________
b. Minimum this afternoon	________	________
c. Maximum this afternoon	________	________

II. Mixing Height (meters)	URBAN	RURAL
a. Maximum yesterday	________	________
b. Minimum this morning	________	________
c. Maximum this afternoon	________	________
d. Minimum tomorrow morning		
e. Maximum tomorrow afternoon	________	________

III. Inversion Data (a.m.) (1. Surface; 2. Aloft)

	URBAN					
	Base	Top	Tx needed to break	Base	Top	Tx needed to break
1.	_____	____	_________	_____	_____	_________
2.	_____	____	_________	_____	_____	_________

IV. Winds	URBAN	RURAL
a. Surface at 1000 LST	__________-Kt.	__________Kt.
b. Surface forecast	__________Kts.	
c. Morning AVW (Actual)	__________m/sec.	__________m/sec.
d. Afternoon AVW (Forecast)	__________m/sec.	__________m/sec.
e. Yesterday's observed AVW(Noon) (6-7 p.m.)	__________m/sec.	_____ _m/sec.

V. Cloudiness	AMOUNT (0-10)
a. Today until 7 p.m.	____________
b. Tonight (7 p.m. until 7 a.m.)	____________

VI. Ventilation	URBAN	RURAL
a. This afternoon (AVW X MXHT) m^2/sec.	__________	__________

VII. Index

a. This morning (Actual) ______________________________

b. This afternoon (Forecast) ______________________________

c. Tomorrow morning (Forecast) ______________________________

d. Tomorrow afternoon (Forecast)______________________________

Note: AVW = average ventilation wind through the mixing layer

T_x = maximum temperature

XHT = mixing height

It is still uncertain how these observational data will be utilized during an air pollution episode. They may be important input in short-period prediction models that are expected to be available. Certain developmental models of this type are predicated upon winds that vary in space and time. Interim application of these data remains qualitative and subjective and should be handled by an experienced meteorologist.

5.1.3.3 Data Handling

Data acquired during episodes will be handled as described in Section 6.1.4.However, the greater frequency and shorter sampling intervals prescribed for episodes will require a much heavier work load than normal. The extra level of effort involved both in observational procedures and in data reporting, reduction, and analysis will be consistent with manpower and program funding limitations. In light of criteria that have been established for determining whether manual and semi-automatic networks should be converted to telemetered, real-time data reduction systems, the planned network does not yet warrant real-time operation. However, the need and justification for this type of operation will be periodically reviewed.

5.1.3.4 Source Inspection

Under episode conditions, it is the principal field duty of the enforcement personnel to ascertain that the Emission Reduction Plan described in Section 5.1.5 is being executed. The available tools and procedures to exercise this function are the same as those used in normal operations (see Sections 6.2.1 and 6.2.2) except that emphasis will be placed upon quick action and rapid response measures. Equipment needed for communications is specified in Section 5.1.2.

Verification of compliance is sometimes difficult. For example, Ringelmann and opacity tests are of little use when a sulfur dioxide episode occurs. Since an effective control technology for particulates is available today and reduction of visible emissions will inevitably result after outlay of funds, effort, and public resolve, the major problem will become the enforcement of sulfur dioxide emission reduction. Violations might sometimes be traced through monitoring station measurements, but conclusive evidence must be obtained at the points of emission. It may be necessary to enter the premises of a suspected violator armed with necessary legal instruments and test equipment. Remedies may then come too late to affect the course of the episode. More direct, faster, legally admissible techniques for determining the amount and type of gaseous emission by scanning the plume from a distance will aid in achieving compliance with the Emission Reduction Plan.

5.1.4 Episode Legal Authority

Additional legislation is necessary for the implementation of emergency action in Ohio. The discussion of episode legal authority is presented in Section 3 of this report.

5.1.5 Emission Reduction Plan

The objective of an Emergency Episode Plan is the temporary reduction of emissions during episodes. The Emission Reduction Plan (ERP) is that part of the total episode plan which directs the orderly and equitable control of source emissions. The ERP builds upon and utilizes the other parts of the episode plan that have been previously presented in Section 5.1, that is: episode criteria, surveillance networks, communications center, and legal authority.

An ERP objectively and quantitatively evaluates all sources within a region and selects the sources for control. The criteria for selection include technical feasibility and economic reasonableness of emergency control, and minimal disruption of community activities.

The development of the ERP for the Ohio portion of the MCIAQCR will begin October 1, 1970, and will be completed by January 1972. Through engineering and economic analyses of the sources in the four-county area, a series of optimum emergency control strategies will be developed.

Cooperation among the numerous jurisdictions in the MCIAQCR is imperative in developing the Emission Reduction Plan. This is so because (1) the Plan, once adopted, must be executed on a region-wide basis; and (2) economies of scale will result by having one central unit, the APCO Committee, responsible for all episode avoidance activities of the Region. Thus, in developing the Emission Reduction Plan for the MCIAQCR, some specific responsibilities will be performed by the Committee and others by the individual States. The separation of tasks and the procedure for developing the ERP are illustrated by the flowchart in Figure 5-3. The elements of the Emission Reduction Plan are summarized in Table 5-2.

To curtail emissions during episodes, a set of emergency strategies for achieving rapid stepwise reductions will be developed. Progressively more stringent control strategies will be specified for each episode level as greater emission reduction is required. Substantial background information will be necessary to determine the essential strategies.

As indicated in Figure 5-3 Emergency Control Questionnaires will be used in conjunction with Emission Reduction Guides to obtain the required technical and cost information from selected sources. The plans submitted by the surveyed sources will be reviewed and approved by the air pollution control agency of each state. Plans that are not acceptable will be returned to the source. If the source does not resubmit a plan, the air pollution control agency will make the necessary revisions. Such adjusted plans will be enforced during episodes.

Once alternative strategies have been evaluated, the optimum strategy will be announced to sources and the public with additional information on recommended procedures for acting and communicating during episodes.

5.1.6 Time Schedule for Emergency Episode Plan Development

The development of the Emergency Episode Plan will require significant time and effort to complete. A time schedule for the completion of essential requirements of the plan is presented in Figure 5-4.

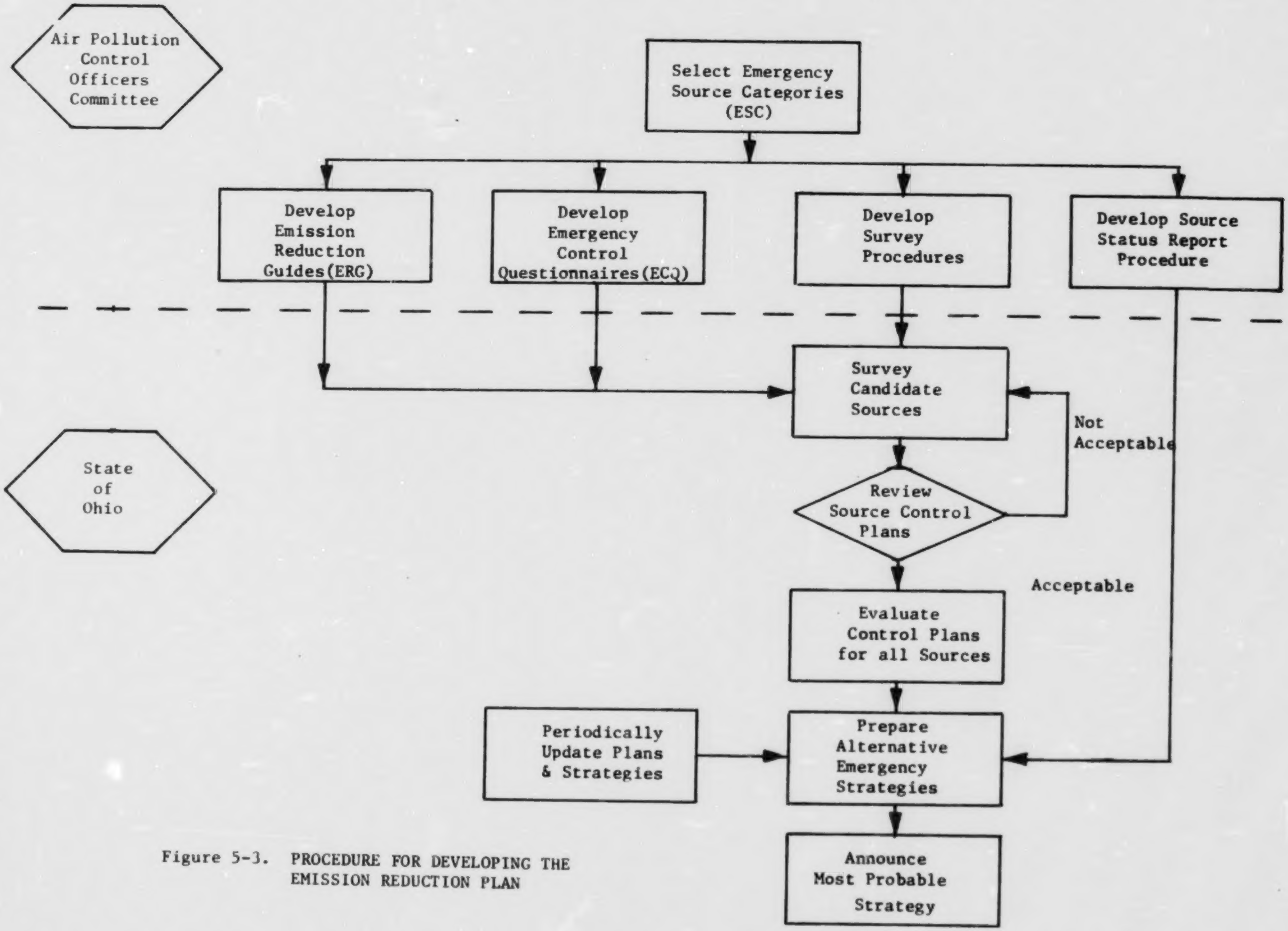

Air Pollution Control Officers Committee
State of Ohio
Select Emergency Source Categories (ESC)
Develop Emission Reduction Guides (ERG)
Develop Emergency Control Questionnaires (ECQ)
Develop Survey Procedures
Develop Source Status Report Procedure
Survey Candidate Sources
Not Acceptable
Review Source Control Plans
Acceptable
Evaluate Control Plans for all Sources
Periodically Update Plans & Strategies
Prepare Alternative Emergency Strategies
Announce Most Probable Strategy

Figure 5-3. PROCEDURE FOR DEVELOPING THE EMISSION REDUCTION PLAN

Emergency* Source Category	Emission Reduction Guides	Emergency Control Questionnaires	Source Surveys	Source Status Reports	Emergency Instruction Notification
I	Detailed process and fuel combustion analysis per source category; extensive review of conventional & emergency control techniques	Complete examination of emissions control alternatives and direct and indirect effects on emitters, region, and nation.	Questionnaire followed by visitation and consultation.	Detailed report of immediate ability to control plus impact of actions on other sources and region.	Detailed instructions to sources on emissions control and communication responsibilities during an episode.
II & III	Review of fuel combustion and incineration operating techniques and emergency control alternatives	Quantification of emission curtailment alternatives and effectiveness	Questionnaire reviewed by telephone if necessary	Observation of fuels used	Instructions on required actions during an episode.
IV	None	None	None	Observation of traffic density	Instructions on required actions during an episode.

* See Table 5- 3 (which directly follows) for the proposed Emergency Source Categories for the MCIAQCR

Table 5-2. EMISSION REDUCTION PLAN ELEMENTS

Table 5-3. PROPOSED EMERGENCY SOURCE CATEGORIES FOR THE MCIAQCR *

ESC-I: INDUSTRIAL AND STEAM ELECTRIC POWER

- Food and Kindred Products
- Furniture and Fixtures
- Paper and Allied Products
- Printing, Publishing and Allied Industries
- Chemicals and Allied Products
- Petroleum Refining and Related Products
- Stone, Clay, Glass and Concrete Products
- Primary Metals Industries
- Fabricated Metal Products, except Ordnance, Machinery and Transportation Equipment
- Machinery, except Electrical
- Electric, Gas, and Sanitary Services (except incinerators)

ESC-II: COMMERCIAL FACILITIES

- Commercial
- Office Buildings
- High-Rises
- Hospitals
- Private and Professional Schools
- Construction

ESC-III: GOVERNMENTAL FACILITIES

- Governmental Offices
- Municipal Incinerators
- Schools
- Military Bases

ESC-IV: TRANSPORTATION AND RESIDENTIAL

- Automobiles
- Airlines
- Mass Transit
- Private Dwellings

* See Table 5-2

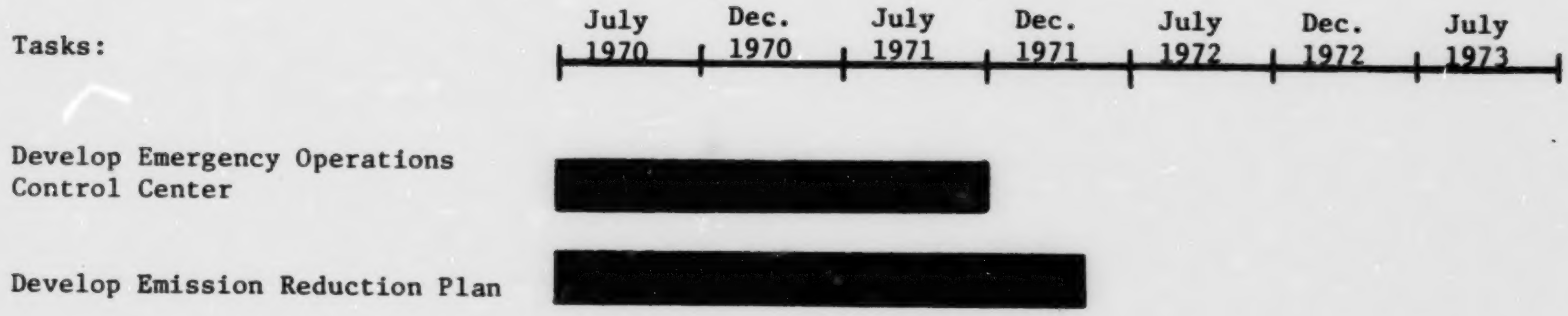


Figure 5-4. MCIAQCR EMERGENCY EPISODE PLAN TIME SCHEDULE

The schedule is based on estimates which assume State personnel will begin actively developing the Plan soon after the adoption of the Implementation Plan.

5.2 INTERIM EMERGENCY EPISODE PLAN

Since the comprehensive Emergency Episode Plan will not be immediately available, an interim Plan will be adopted to protect the citizens of the Region. Specific actions for source control, agency personnel, and relevant organizations have been developed for the MCIAQCR and the states in the MCIAQCR. The actions are presented in Table 5-4. The following aspects of the Emergency Episode Plan are presented for the Forecast, Alert, Warning, and Emergency stages:

I. Episode Criteria
II. Intrastate Episode Authority
III. Episode Surveillance
IV. State Emission Reduction Plans
V. Episode Communications
VI. Emergency Episode Staff

The interim Emergency Episode Plan heavily depends upon voluntary compliance of major sources within the MCIAQCR. Nearly all sources are candidates for emergency control during episodes. A list of the major point sources is presented in Table 5-5. Only sources at individual plant locations with particulate or sulfur oxide emission rates equal to or greater than one ton per day are cited. The sources are listed by state within the Region. Within each state, the sources are listed alphabetically. The pollutant emission rates were determined by the NAPCA emission inventory for the MCIAQCR.

The interim Plan includes the required actions to be taken by each source category at specific stages of an air pollution episode. The Plan is based on general knowledge of the source types and the ability of such sources to control emissions during episodes.

At the present time, the engineering and economic information about each source within the MCIAQCR is not available to determine scientifically the optimum strategy or series of preferred strategies.

TABLE 5-4. METROPOLITAN CINCINNATI INTERSTATE AIR QUALITY CONTROL REGION. INTERIM EMERGENCY EPISODE PLAN

Section I EPISODE CRITERIA		(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
High Air Pollution Potential Advisory (hours)		36	None needed	None needed	None needed
Air Quality Measurements (24-hour Averages)	Particulates (COH/1000 LF)	No specified level	2.0	4.0	6.0
	Sulfur Dioxide (ppm)	No specified level	0.10	0.25	0.40

Section II INTRASTATE EPISODE AUTHORITY	(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
Authorized State AP Official	Alert staff	Activate "alert" staff and announce "alert"	Activate "warning" staff	Activate "emergency" staff
State Governor(or AP Commissioner)	No action	No action	Announce "warning"	Announce "emergency"
State Attorney General Office	No action	No action	Assist enforcement procedures	Assist enforcement procedures

Section III EPISODE SURVEILLANCE	(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
Air Quality Monitoring	Increase measurement frequency	Maintain hourly measurements	Maintain hourly measurements	Maintain hourly measurements
Meteorological Monitoring	Increase frequency of measurements	Maintain frequency of measurements	Maintain frequency of measurements	Maintain frequency of measurements
Data Handling	Evaluate incoming data and prepare wall charts	Evaluate incoming data and prepare wall charts	Evaluate incoming data and prepare wall charts	Evaluate incoming data and prepare wall charts
Source Surveillance	No action	Inspect major sources	Follow plan for source inspection	Follow plan for source inspection

SECTION IV STATE EMISSION REDUCTION PLANS	(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
Control Strategist	Review emission reduction plans	Request "alert" control	Request "warning" control	Request "emergency" control
Power Generating	Inform of conditions	Substantial reduction - fuel switch or load shift	Maximum reduction - fuel switch or load shift	Maximum reduction - fuel switch or load shift
Other Fuel Burning Sources Industrial	No action	Fuel switch - limit cleaning and start-up;partial shutdown	Fuel switch - limit cleaning and start-up; partial shutdown	Maximum possible reduction
Commercial	No action	Substantial reduction	Maximum reduction	Maximum possible reduction
Processing	No action	Fuel switch; limit cleaning and start-up	Fuel switch; limit cleaning and start-up	Maximum possible reduction
Residential	No action	No action	Limit electrical consumption and reduce room temperature to 65°F	Limit electrical consumption and reduce room temperature to 65°F
Fuel Suppliers	No action	Provide assistance to customers	Provide assistance to customers	Provide assistance to customers
Incineration Municipal	Alert	Maximum reduction	Prohibit operations	Prohibit operations
Commercial	No action	Maximum reduction	Prohibit operations	Prohibit operations
Residential	No action	Prohibit operations	Prohibit operations	Prohibit operations
Open Burning	Alert	Prohibit operations	Prohibit operations	Prohibit operations
Manufacturing Continuous	No action	Minimum reduction	Maximum reduction	Maximum reduction or curtail operations
Batch Process	Alert	Minimum reduction	Partial shutdown	Curtail operations
Commercial Entertainment	No action	No action	Prepare to shut down	Shut down
Office Work	No action	No action	Prepare to shut down	Shut down
Business	No action	No action	Prepare to shut down	Shut down
Government Schools	No action	No action	Prepare to shut down	Shut down
General Office	No action	No action	Prepare to shut down non-essential activities	Shut down non-essential activities
Construction	No action	Shut down dust production activities	Prepare to shut down all activities	Shut down all activities
Motor Vehicles	No action	No action	Request non-essential travel be stopped	Prevent all but emergency travel to downtown
Public Transportation	No action	No action	No action	Provide emergency transportation

Table 5-4. (continued)

Table 5-4. (continued)

SECTION V EPISODE COMMUNICATIONS (from emergency operation control center to:)		(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
Federal Facilities	C	Not notified	Contact through NAPCA representative	Contact through NAPCA representative	Contact through NAPCA representative
Emission Sources	S	Inform selected sources	Contact through news media and telephone	Contact through news media and telephone	Contact through news media and telephone
News Media (public)	C	Not notified	Send press release "A"	Send press release "W"	Send press release "E"
Hospitals	C	Not notified	Recommend precautionary measures	Recommend precautionary measures	Recommend precautionary measures
Police Department	S	Not notified	Alerted	Request enforcement assistance	Request enforcement assistance
Telephone Company	C	Not notified	Alerted	Request emergency procedures	Request emergency procedures
NAPCA	C	Report conditions	Report conditions	Report conditions	Request assistance
ESSA (U.S. Weather Bureau)	C	Request meteorological info.	Request meteorological info.	Request meteorological info.	Request meteorological info.
State Governor (or AP Commissioner)	S	Not notified	Report conditions	Request "Warning" Announcement	Request "emergency" announcement
State Department of Traffic & Highways	S	Not notified	Alerted	Request traffic reroute	Request traffic reroute

NOTE:

C = announcement resulting from APCO Committee dicision

S = announcement resulting from state official

Table 5-4. (continued)

SECTION VI EMERGENCY EPISODE STAFF		(F) FORECAST	(A) ALERT	(W) WARNING	(E) EMERGENCY
EOCC Director	E	Alerted	Direct staff, communicate with state official, review public announcement	Direct staff, communicate with state official, review public announcement	Direct staff, communicate with state official, review public announcement
Chief Chemist	E	Alerted	Coordinate air quality monitoring and analysis	Coordinate air quality monitoring and analysis	Coordinate air quality monitoring and analysis
Chief Engineer (Strategist)	E	Alerted	Determine optimum source control strategy	Determine optimum source control strategy	Determine optimum source control strategy
Chief Compliance Officer	S	Alerted	Coordinate Field inspections	Coordinate field inspections	Coordinate field inspections
Program Management, Chief	E	No action	Coordinate data handling effort	Coordinate data handling effort	Coordinate data handling effort
Control Engineers	S	No action	Assist sources and evaluate control status	Assist sources and evaluate control status	Assist sources and evaluate control status
Meteorologist	E	Issue local air pollution advisories	Communicate with sources of met. data, evaluate data.	Communicate with sources of met. data, evaluate data	Communicate with sources of met. data, evaluate data
Chemists	S	No action	Analyze samples	Analyze samples	Analyze samples
Technicians	S	Collect air quality samples	Collect and evaluate air quality samples	Collect and evaluate air quality samples	Collect and evaluate air quality samples
Inspectors	S	No action	Source inspections	Source inspections	Source inspections
Clerical	E	Record data and operate telephones	Record data and operate telephones	Record data and operate telephones	Record data and operate telephones
Records Analysts	E	Review emergency control data	Supply strategist with data and maintain wall charts	Supply strategist with data and maintain wall charts	Supply strategist with data and maintain wall charts
Physicians (volunteers)	E	No action	No action	Consult with Director	Consult with Director
Communication Specialists	E	No action	Prepare special press releases	Prepare special press releases	Prepare special press releases
State Police Department	S	No action	Review enforcement procedures	Assist with enforcement	Assist with enforcement

NOTE:

S = denotes state activity

E = denotes EOCC activity

Table 5-5. MAJOR POINT SOURCES IN THE MCIAQCR

OHIO	Sulfur Oxides (tons/year)	Particulates (tons/year)
Andersonville Dump	0.17	6.85
Armco Steel Corp.	11.93	50.62
Center Hill Incinerator	0.58	1.62
Champion Paper Co.	15.73	3.37
Cincinnati G&E Co. (Beckjord Station)	368.59	28.12
Cincinnati G&E Co. (Miami St. Station)	162.20	125.99
Colerain Dump	0.17	6.85
Container Corp. of America	1.90	1.50
Crystal Tissue Co.	1.56	2.63
Diamond National Corp(Lockland Plant)	5.42	1.21
Diamond National Corp(Middletown Plant)	4.42	1.64
Dunbar Incinerator	0.14	1.24
E.I.DuPont de Nemours Co., Inc.	14.20	---
Emery Industries Inc.	3.50	2.80
Ford Motor Co. (Sharonville Plant)	1.30	3.30
Formica Corp	3.67	----
Fox Paper Co.	1.28	1.43
General Electric Co.	3.64	9.22
Gulf Oil Corp.	2.90	0.24
Hamilton Municipal Power Plant	6.21	4.99
Hilton Davis Chemical Co.	2.53	0.11
International Chemical Co.	2.59	----
National Lead Co. of Ohio	1.56	1.05
Philip Carey Corp.	2.38	7.35
Procter and Gamble Co.	6.08	5.22
Reading Power Plant	1.10	0.09
Sorg Paper Co.	4.03	12.50
Stearns and Foster Co.	1.87	1.11
West Fork Incinerator	0.30	1.84

Short-term episode-meteorological diffusion models for regions are not available at this time to test the adequacy of the proposed interim Plan. Without analytical tools to evaluate the effectiveness of the Plan, a philosophy which stresses the protection of the health of the citizens has been taken. Thus, a relatively stringent Plan is recommended. When meteorological tools are developed and are practical for a region the size of the MCIAQCR, such will be incorporated into the comprehensive Emergency Episode Plan.

A selective emergency emission reduction strategy may be used when an episode is discovered in one localized area. The most efficient and economical strategy in such a case will be the emergency control of sources within the immediate geographical area or control of nearby sources that are directly affecting the episode.

Whenever possible, sources in similar source categories will be treated equally. The factors of: (1) effectiveness of temporary control, (2) the required response time for emergency control, and (3) economic impact on the source will all be considered in determining the interim ERP, when such factors are known.

Although the interim ERP will be based on voluntary compliance of major point sources, temporary injunctive relief can be requested through local courts when sources will not voluntarily comply with control orders.

Until the recommended air quality monitoring network is operational, the existing network will satisfy the need for episode air quality determination.

Meteorological information will be obtained from the U.S. Weather Bureau. Additional meteorological information, if needed, will be obtained through private sources.

6. AIR QUALITY MONITORING

6.1 OBJECTIVES

Ambient air sampling is required to assess current air quality, determine the degree of improvement necessary and measure the results of control and abatement actions. A second major requirement is for the provision of intelligence prior to, during, and following actual or potential air pollution episodes in order to determine emission curtailment tactics for episodal avoidance.

Requirements are divided into two categories, based on desired averaging times:

- Contaminant concentration on a schedule; intermittent hourly/daily basis
- Continuous real-time monitoring providing 15-minute average concentrations and running averages of one hour, eight hours, and 24 hours

Based on these criteria, two types of air quality monitoring sites are required. These are designated as primary and secondary monitoring stations.

The following are the pollutants of immediate concern, the techniques for monitoring, the type of equipment needed, averaging time, and data summary report period for primary and secondary monitoring sites.

Primary Monitoring Station

Pollutant	Monitoring Technique	Sensor	Averaging Time	Report Period
Sulfur Dioxide	Colorimetric or Coulometric	Continuous	Hourly	Monthly
Particulates	Filtration (Suspended)	Intermittent	24-Hour	Quarterly
	Filtration (Soiling)	Continuous	2-Hour*	Monthly
Wind Speed**	Anemometer	Continuous	Hourly	Monthly
Wind Direction**	Wind-Vane	Continuous	Hourly	Monthly

---

*One-Hour averaging during episodes
**Taken at several selected sites (to be determined)

Secondary Monitoring Station

Pollutant	Monitoring Technique	Sensor	Averaging Time	Report Period
Sulfur Dioxide	Colorimetric	Intermittent (daily, 24 samples)	Hourly	Monthly
Particulates	Filtration (Suspended)	Intermittent	24-Hour	Quarterly

6.1.1 Location of Sampling Stations

Air quality monitoring sites represent pollutant density in their immediate area (normally within a radius of 1/2 - 3/4 mile around the site), are directly influenced by the proximity of emission sources (emission density), and monitor the impact of pollutants on people working of living in their immediate area (dosage). Therefore, each projected station has been evaluated according to these three considerations as follows:

- Pollution Density*

  Based on real and simulated pollutant averages, annual levels of suspended particulates and sulfur oxides were plotted according to multiple concentration ranges. These were classified as values greater than, equal to, and less than approved Air Quality Standards.

- Population Density*

  Based on 1968 data, population density was plotted by three categories: high, median, and low.

- Emission Density*

  Based on emissions inventory data (1969) compiled for this report for suspended particulates and sulfur oxides, annual emission densities were plotted. These are representative of high, median, and low levels of source concentrations.

Table 6-1 presents the projected regional air quality monitoring network. Each site is described by category and evaluated according to the above noted criteria. Its location in the AQCR is fixed and its actual or scheduled start-up is listed. The numbers and general locations of sampling sites were selected to represent the best judgment regarding the allocation of resources necessary to meet the previously stated surveillance objectives.

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*Maps showing the pollutant concentrations, population density, and emission density are presented in Section 1 and were used in determining sampler placement.

TABLE 6-1. PROJECTED REGIONAL AIR QUALITY MONITORING NETWORK

Station Type	Pollution Density			Population Density			Emission Density			Location	Start-Up Date
	H	M	L	H	M	L	H	M	L		
o Primary	X			X			X			Central and Ann Streets, Cincinnati, Ohio	Jan., 1962
o Primary	X			X			X			Drake Hospital Galbraith Road Cincinnati, Ohio	Jan., 1971
o Primary		X		X				X		Main and Dayton Streets, Hamilton, Ohio	April, 1971
o Primary	X			X			X			600 5th Street Newport, Kentucky	Jan., 1971
o Secondary	X			X			X			1055 Laidlaw Avenue Cincinnati, Ohio	Jan., 1968
o Secondary	X			X			X			General Protestant Orphanage, Madison Road, Cincinnati,Ohio	April, 1971
o Secondary		X		X				X		Parkland & Twain Saylor Park Cincinnati, Ohio	July, 1971
o Secondary			X		X				X	800 Bauer Ave.-B.H.S. Batavia, Ohio	July, 1971
o Secondary	X			X				X		Galbraith & Blue Ash Deer Park, Ohio	July, 1971
o Secondary	X				X		X			E. 4th St. - F.H.S. Franklin, Ohio	Jan., 1971
o Secondary		X		X					X	Sharon & Winton Roads Greenhills, Ohio	July, 1971
o Secondary		X			X			X		230 S. Elm Street Harrison, Ohio	Jan., 1971
o Secondary			X		X				X	25 Oakwood Avenue Lebanon, Ohio	Jan., 1971

TABLE 6-1 Continued:

Station Type	Pollution Density			Population Density			Emission Density			Location	Start-Up Date
	H	M	L	H	M	L	H	M	L		
o Secondary		X				X		X		State & Hill Streets Miamitown, Ohio	Jan., 1971
o Secondary	X			X			X			1240 Central Avenue Middletown, Ohio	April, 1971
o Secondary		X			X		X			N.R. Fire Dept., Market Street New Richmond, Ohio	July, 1971
o Secondary	X					X			X	U.S. 50 & St. Rt. 128 North Bend, Ohio	July, 1971
o Secondary			X		X				X	Talawanda High School Chestnut Street Oxford, Ohio	Jan., 1971
o Secondary	X				X		X			Short & E. Williams Lawrenceburg, Indiana	Jan., 1970
o Secondary			X			X	X			State Route 56 Rising Sun, Indiana	Jan., 1971
o Secondary	X			X			X			7th and Scott Street Covington, Kentucky	Jan., 1968
o Secondary		X		X				X		505 Commonwealth Ave. Erlanger, Kentucky	Jan., 1967
o Secondary		X			X				X	Veterans Hospital Ft. Thomas, Kentucky	Jan., 1971
o Secondary		X			X		X			Rt. 20 Petersburg, Kentucky	July, 1971
o Secondary			X		X				X	U.S. 25 & Stevenson Road Walton, Kentucky	Jan., 1971

Figure 6-1 graphically displays the network configuration. Superimposed on the display of sampling location is an isopleth projection of predicted annual arithmetic average particulate concentrations. (See Section 2.2.) This display indicates that areas of maximum pollutant concentrations will be adequately sampled by the proposed network.

6.1.2 Frequency of Collection

Data will be collected on a continuous basis from all automatic SO_2 analyzers utilized. Sequential samplers will measure SO_2 for 24 consecutive one-hour periods every third calendar day.

Twenty-four hour concentrations of suspended particulates will be collected on all hi-vol samplers utilized every third calendar day.

Soiling particulates will be collected continuously at two-hour intervals at all primary monitoring stations.

6.1.3 Methods of Sampling

Prescribed methods of measuring and monitoring atmospheric sulfur oxides are referenced from Public Health Service Publication No. 999-AP-6 (1964). The methods for atmospheric sampling and analyses of suspended particulate matter are referenced from the APCA Recommended Standard Method, APM-2.5 (1967). The methods for atmospheric sampling and analysis of soiling particulate matter are referenced from the APCA Recommended Standard Method, APM-2.1 (1963).

6.1.4 Data Handling and Analysis

6.1.4.1 Support Services

The Cincinnati Division of Air Pollution Control will provide the data handling support services for the four-county air monitoring network. Services will include preparing data for computer input, maintenance of master files of magnetic tape, preparation of routine (monthly and annual) reports, and the development of routine and special data analysis. Copies of routine reports and special data analyses will be provided to the State of Ohio Air Pollution Unit.

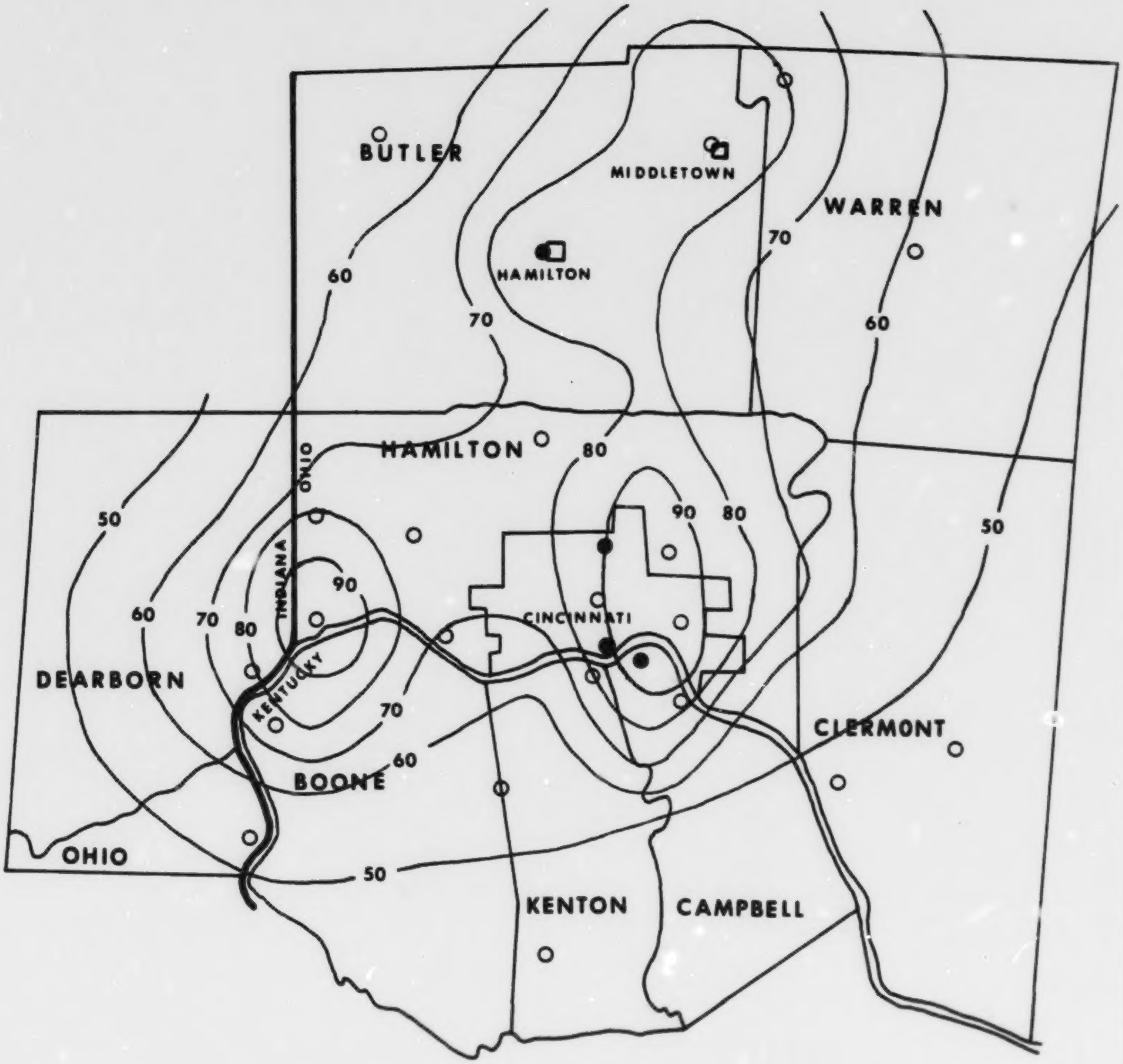
BUTLER
MIDDLETOWN
WARREN
HAMILTON
60
70
70
60
HAMILTON
80
90
80
50
50
OHIO
INDIANA
90
CINCINNATI
60
70
80
DEARBORN
KENTUCKY
70
60
BOONE
CLERMONT
OHIO
50
KENTON
CAMPBELL
● Primary Station
○ Secondary Station

Figure 6-1. Location of Proposed Air Quality Monitoring Stations in the MCIAQCR. Superimposed are Ground Level Particulate Isopleth Concentrations (See Section 4.2). (Concentrations shown represent annual arithmetic mean values in μg/m^3.)

A computerized system is now in the initial stage of development. At monthly intervals the data will be keypunched and forwarded to the City/County Computer Center for processing and analysis. This system will process all types of ambient air quality measurements and will be operational by July 1971.

6.1.4.2 Suspended Particulates

Following the 24-hour sample collection period, filters from the high volume samplers are analyzed by the Cincinnati Analytical Laboratory. The laboratory technician records the particulate concentrations on data record forms. Data processing and analysis are now (July 1970) being performed manually.

6.1.4.3 Soiling Index

Sampling to determine soiling is done on a two-hour basis during periods of normal operation. Measurements of light transmission through the filter paper are made at the beginning and end of the sampling period. Results are now being recorded on strip charts. At weekly intervals the strip charts are forwarded to the laboratory where a technician computes the soiling index in COHs/1000 linear feet. Results are manually recorded, summarized, and analyzed.

6.1.4.4 Sulfur Dioxide

Continuous sampler measurements of sulfur dioxide are recorded on a strip chart. At weekly intervals the strip charts are forwarded to the laboratory where technicians reduce data manually. Results are entered on data record forms. Monthly and annual summaries are prepared manually. As soon as practicable the strip chart recorders will be replaced with magnetic tape recorders which, in turn, will be computer processed at weekly intervals. The computerized system will also include the necessary computer programs to prepare the required monthly and annual data summaries and analyses.

6.1.4.5 Sequential Samplers

The sequential sulfur dioxide samplers yield 24 one-hour samples. These samples are forwarded to the laboratory for analysis. At the present time, the laboratory technician determines the concentration of SO_2 and manually records the results on data record forms. Monthly and annual data summaries are also prepared manually.

The computerized data system previously mentioned will permit more efficient handling of data from these samplers. After the technician records initial results on data record forms, all subsequent data processing and analysis will be handled by automated procedures.

6.1.4.6 Episode Sampling

During episode situations, the four primary monitoring stations will provide the real-time information necessary for effective timely control actions. As these stations are installed, the data transmission system described in Section 6.4 will provide a link to the continuous pollutant analyzers. Also during periods of high air pollution potential, the sampling interval for the spot samplers will be reduced to one hour. These instruments may be read directly at the sampling site; or, alternatively, a system is currently being investigated which would permit interrogation via data phone from the central control station (EOCC, Section 5).

While the emphasis during an episode will be on the rapid collection and evaluation of data from the primary monitoring systems, certain secondary stations will be used for defining the geographical limits of severe pollutant concentrations. Technical Service personnel from all three state agencies, under the direction of the Episode Control Officer, will man selected secondary stations. Through the use of a central laboratory facility, results from these stations can be made available with minimum delay (four hours after sampling).

6.2 CONTROL OF EMISSION SOURCES

This function of the total air pollution control effort encompasses both Engineering and Enforcement services personnel. It includes two separate systems, each system being made up of two programs as follows:

- Source Surveillance
  - (a). Source Identification and Registration
  - (b). Permit to Construct
  - (c). Permit to Operate
- Source Inspection - Field Operations
  - (a). Fuel Burning Sources, Industrial Sources
  - (b). Complaint Investigations and Field Patrol

6.2.1 Source Surveillance

All new or existing control apparatus and/or appropriate equipment used within the Region will be required to obtain a Permit to Construct and/or a Permit to Operate. This mechanism will guarantee source identification and registration. The following apparatus and equipment will be required to obtain Permits:

- All control apparatus
- Equipment used in a manufacturing process involving surface coating, including but not limited to spray and dip painting, roller coating, electrostatic depositing or spray cleaning which emits air contaminants into the open air and in which the quantity of material used in any source operation is in excess of 10 pounds in any one hour.
- Equipment used in a manufacturing process involving metal cleaning or surface preparation, including but not limited to degreasing, etching, pickling, or plating which emits air contaminants into the open air from a tank or vessel, the capacity of which is in excess of 100 gallons.
- Equipment, used in a manufacturing process, with some exceptions to be defined, which emits air contaminants into the open air either directly or indirectly and in which the combined weight of all materials, excluding air and water, introduced into any one source operation is in excess of 50 pounds in any one hour.
- Liquid storage tanks, reservoirs, and containers, used for the storage of acids, solvents, diluents or thinners, inks, colorants, lacquers, enamels, varnishes, liquid resins and having a capacity in excess of 10,000 gallons.
- Pneumatic material handling or conveying systems.

- Commercial fuel burning equipment in which the rate of solid fuel burned is in excess of 1,000,000 BTU's in any one hour.
- Any equipment used for the burning or incineration of non-commercial fuel or process by-products in the form of liquid, solid, or gas.
- Any incinerator, except incinerators constructed, installed, or used in one or two family dwellings or in multi-occupied dwellings containing six or less family units, one of which is owner occupied.

Prior to issuance of a Permit to Operate, an engineer will observe the equipment in operation at design capacity. At that time, the equipment will be checked with the plans and specifications previously submitted. During the inspection, observations will be made to determine that:

- the equipment is physically located as shown on the equipment location drawing,
- the equipment is constructed as indicated in the application,
- the equipment is capable of operating in compliance with the applicable rules and regulations of the State Air Pollution Control Agency,
- source testing is or is not necessary.

Based on the engineers' inspection and evaluation of the equipment and process as well as relevant source test results, a recommendation will be made by the engineer regarding the issuance or denial of permit to operate. After review and approval of the recommendation, action will be taken by the State Agency to approve or deny the Permit to Operate.

Source testing capability to support the Permit to Operate program currently exists in the Cincinnati Agency, for the Ohio Program. It will be developed or expanded in the Kentucky and Indiana state agencies. This capability will consist of trained personnel (normally a two-man team) and equipment for determining particulates, sulfur oxides, and other gaseous emissions.

A person desiring to construct or alter and operate any equipment capable of emitting air contaminants will be required to apply for a Permit to Construct from the appropriate air pollution control agency. The agency will furnish application forms, written instructions, and information required for proper filing. The application will be logged, dated, and assigned an identification number. All information pertinent to the application, including data and drawings, will be submitted to an air pollution control engineer for review and evaluation. Based on the engineer's review, the application will be approved and the applicant may proceed with construction, or the applicant will be requested to confer with the engineer to discuss questionable aspects of the application. In the event that disagreements cannot be resolved by submission of additional information, minor changes in the proposals, or an acceptable explanation by the applicant, the application will be denied.

This mechanism will be installed and operated by the Necessary emissions inventory data will be abstracted at the local level by the State Agencies for entry into the Regional Data Bank. The State will reserve the right to negate Permits to Operate issued to sources which are found in violation of State regulations.

6.2.2 Source Inspections - Field Operations

Equipment installed, placed in operation, and issued a Permit to Operate will then come under the jurisdiction of Enforcement Services personnel. This group is responsible for policing sources of air pollution within its area of jurisdiction to insure compliance with applicable rules and regulations of the agency.

Each Enforcement Unit will encompass the following functional activities:

Industrial Inspections

- Continuously inspect assigned manufacturing plants
- Prepare source inventories
- Check compliance with permit system and conditions of variances in assigned industries
- Investigate breakdowns
- Investigate complaints made against assigned industries

Field Patrols

- Patrol assigned zones including highways and waterways for all visible violations from stationary and mobile sources
- Enter and cite all plants where visible violations are observed
- Keep under surveillance plants on referral from other sections
- Answer public complaints

Communications

- Maintain and operate radio transmitter and receiver 24 hours a day for:
  a. Complaints, instructions, and data to mobile units
  b. Declaration of alerts to specified industries and all mobile units
  c. Receipt and recording of data from air monitoring stations

6.2.3 Schedule

The Source Surveillance System will be completely implemented and operational by January 1973.

The Field Operations and Inspection Systems will be operational by January 1972.

6.3 REGIONAL DATA BANK

A regional data bank will be established and maintained by the City of Cincinnati agency. In order to maximize the utility of collected data in planning and decision making, a total data management system will be developed. Following is a brief summary of the elements of such a system and an estimate of the monthly computer time.

- Air Quality and Meteorological data (Operational by July 1971).

It will be necessary to develop a series of ten computer programs to handle the routine processing of air quality and meteorological data. The air quality monitoring system will yield in excess of 50,000 measurements each month. It will be necessary to convert these data to engineering units, validate the data, update master files, and prepare routine data tabulations and statistical summaries. The monthly computer usage will be ten hours.

These programs will provide a continuing evaluation of the progress toward the attainment of air quality standards. In addition, the programs will provide frequency distributions of pollutant concentrations, relationships among air quality and meteorological parameters, geographical distribution of pollutants, and the like. The monthly computer usage will here be six hours. Approximately two hours per month of an x - y plotter will be utilized.

- Emission Inventory (Operational by January 1971)

The data bank will maintain a current inventory of all sources of air pollution. Such data is necessary to show progress being made in the reduction of total emissions to the atmosphere. A series of 4-6 computer programs will be developed to handle this data; the actual update of the inventory will result from the data collected through the operation of the Permit System. File update will require four hours of computer time per month.

- Permit System (Operational by January 1971)

To maintain control of sources of air pollutants, a permit system will be established. Administration of this system will require a series of 3-4 computer programs. Monthly computer time required will be four hours per month.

- Diffusion Modeling (Operational by January 1972)

In order to assess the adequacy of emission regulations, it is necessary to supplement measurements of air quality with estimates of air quality derived from a mathematical model of atmospheric diffusion. Computer programs are available from NAPCA. Minor modifications will be made to adapt these programs to the RCA Computer. Diffusion modeling will be performed on an annual basis and will require 20 hours per year.

6.4 AIR QUALITY DATA TRANSMISSION

Routinely, data from the continuous analyzers will be manually reduced, punched on input cards, and stored in the computer. No extensive telemetry system will be initially employed.

However, a telephone interrogation system for the automatic monitors at all primary sampling stations will be installed as the stations are activated. This system will consist of a telephone, data processing set, and a teletype printer located at the control center (Cincinnati Air Pollution Control Agency). A data transmission set and a computer-serializer unit will be located at each remote site. A command from the control center, generated by dialing the unlisted phone of the field station, will signal the data transmission set which then activates the computer-serializer unit. This unit takes a millivolt signal from the appropriate automated monitor and converts it to a signal compatible with the Bell System transmissions equipment. At this point, the transmission set sends a signal over the Bell System's lines to the central control station. The signal is then processed and displayed by means of a teletype printer. After processing sequentially through the available field monitors, the computer-serializer generates a disconnect pulse for the completion of the sequence.

The major objectives of this system are:

- Routine interrogation of field stations to establish the priority of maintenance requirements. A more efficient utilization of the instrument technician will be achieved, thus resulting in the overall reduction of manpower needs.
- Frequent interrogation during emergency episode periods to provide the EAC with a link to "real-time" data.

7. RESOURCES

7.1 GENERAL

The enactment of enabling legislation and adoption of emission control regulations will not of themselves accomplish the air quality goals set forth in this Implementation Plan. Realization of these goals depends to a great extent upon the ability of the control agencies to enforce abatement programs. Such enforcement, in turn, is contingent upon the availability of adequate resources, the most crucial resource being manpower.

In the determination of manpower requirements, the NAPCA manpower model was used. Briefly, this model uses four area characteristics (land area, population, number of manufacturing establishments, and capital expenditures) to estimate man years of effort required to support some fourteen functions carried out by a control agency.

The organizational structure of the various control agencies within the MCIAQCR is an important factor in determining the required resources. An analysis of the various organizational alternatives considered in the preparation of this Implementation Plan is presented in Appendix C. Consideration was given to the structure of intrastate control agency operations as well as to possible areas of interstate cooperation.

The following two sections present the control agency requirements for the Ohio portion of the MCIAQCR as determined by the manpower model. Section 7.4 indicates the current staffing and funding levels and those levels actually projected by the State and local control agencies for fiscal year 1971.

7.2 CALCULATED MAN-YEARS

Area characteristics for each county are presented in Table 7-1. Because the allocation of resources between the state and local agencies has not been determined, the manpower model was used to estimate man-years of effort required in the entire Ohio portion of the MCIAQCR. A summary of the output from the manpower model is presented in Table 7-2. A total

TABLE 7-1. INPUT CHARACTERISTICS OF OHIO NEEDED FOR MANPOWER ESTIMATES

County(ies)	Area (Sq. Miles)	Population (1970 est.)	Manufacturing Establishments	Capital Expenditures ($)
Ohio				
Hamilton	414	987.2×10^3	1758	72.8×10^6
Clermont	458	111.1×10^3	195	16.5×10^6
Butler	471	244.7×10^3	195	16.5×10^6
Warren	408	96.5×10^3	195	16.5×10^6
Total	1751	1439.5×10^3	1953	89.3×10^6
Region Total	2707	1.735×10^6	2172	94.6×10^6

TABLE 7-2. SUMMARY OF MAN-YEAR ESTIMATES FOR OHIO PORTION OF MCIAQCR

FUNCTION	PREDICTOR	MANPOWER FACTOR	CALCULATED MAN-YEARS
1. Monitoring			
Primary	7	0.5	(3.5)
Secondary	22	0.2	(4.4)
Total			7.9
2. Inspections	1.95	2.8	5.5
3. Complaints	12.1	1.0	12.1
4. Permits	0.89	9.7	8.6
5. Policy	34.1	0.22	7.5
6. Training	34.1	0.12	4.1
7. Special Studies	34.1	0.06	2.0
8. Emission Estimates	34.1	0.05	1.7
9. Engineering Reports	34.1	0.06	2.0
10. Administration	34.1	0.59	20.1
11. Data Processing	34.1	0.09	3.1
12. Source Testing	14.1	0.10	1.4
13. Instrumentation	9.9	0.25	2.5
14. Laboratory	11.3	0.35	4.0
Total			82.5

of 82.5 man-years of effort is required to sustain an adequate control program for the four-county area.

It is assumed that the required manpower will not be realized until FY 1973. A summary of man-years which existed at the end of FY 1970 (June 30, 1970) is presented in Table 7-3. It is apparent that the manpower presently committed to the four county control agencies is far from adequate. Assuming that the necessary funding discussed in the following section is available, the recruitment of the necessary personnel presents a serious problem. The schedule for personnel increases in the Ohio program is shown in Table 7-4 for the present FY 1971 through FY 1973. This schedule is coordinated with the funding requirements presented in the next section (7.3).

7.3 FUNDING

The funding required to support the control agencies operating on the four county area is projected upon the basis of the staffing presented in Table 7-4. Salaries for the various categories of personnel are based upon information contained in the NAPCA Program and Financial Needs Report for the MCIAQCR (Table 7-5). Salaries are burdened by an overhead factor equivalent to one third of the base salary. Overhead includes such things as fringe benefits, facilities and support, and additional operating expenses (travel, utilities, consumables, etc.).

A summary of costs for three years beginning with FY 1971 are presented in Table 7-6. The goal is to reach the required level of operation by FY 1973 when it is estimated that in excess of $1.15 million will be necessary. This represents about a three-fold increase over the existing level of funding.

The sources of revenue which will produce the projected level of funding are uncertain as of the writing of this report. It is assumed that the City of Cincinnati will provide a substantial portion of this cost since the major sources of emission are located within the city. Furthermore, it is assumed that present Federal grants will be extended

TABLE 7-3. ESTIMATED PRESENT MANPOWER UTILIZATION BY CONTROL AGENCY FOR OHIO AND FOR THE TOTAL MCIAQCR

CONTROL PROGRAM	STATE AGENCY OHIO	REGIONAL TOTALS
Management		
Policy	2	2.6
Training	1	1.6
Administrative	4	4.8
Sub-Total	7	9.0
Enforcement		
Inspections	1	1.4
Complaints	4	4.3
Source Registration	1	1.1
Sub-Total	6	6.8
Engineering		
Permits	0	0.2
Emission Est.	2	2.3
Source Test.	1	1.1
Reports; Reg.	0	0.0
Sub-Total	3	3.6
Technical Services		
Monitoring	1	1.0
Special Studies	0	0.0
Data Processing	0	0.0
Instrumentation	0	0.0
Laboratory	1	1.0
Sub-Total	2	2.0
Totals	18	21.4

TABLE 7-4. SUMMARY OF ESTIMATED MAN-YEARS FOR OHIO PORTION OF THE MCIAQCR

Control Program	Ohio			Regional Total		
	FY 71	72	73	71	72	73
Enforcement						
Scheduled Inspect.	5.0	5.5	5.5	5.6	6.1	6.1
Complaints; Field Patrol	8.0	10.0	12.1	12.3	14.7	16.8
Sub-Total*	13.0	15.5	17.5	18.0	21.0	23.0
Engineering Services						
Permit System	3.0	5.0	8.6	3.5	5.5	9.1
Emission Estimates	1.5	1.5	1.7	2.0	2.0	2.2
Source Testing	1.2	1.4	1.4	1.4	1.6	1.6
Reports, New Leg., etc.	1.0	2.0	2.0	1.6	2.6	2.6
Sub-Total*	6.5	10.0	13.5	8.5	12.0	15.5
Technical Services						
Monitoring Network	4.0	6.0	7.9	6.0	8.4	10.4
Special Studies	0.5	1.0	2.0	1.1	1.6	2.6
Instrument Calibration	1.5	2.0	2.5	2.1	2.7	3.3
Laboratory	2.0	3.0	4.0	2.6	3.7	5.2
Data Processing	2.0	3.0	3.1	2.6	3.6	3.8
Sub-Total*	10.0	15.0	19.5	14.5	20.0	25.5
Management Services						
Policy, Strategies etc.	4.0	6.0	7.5	5.1	7.7	9.4
Staff Training	2.0	3.0	4.1	2.6	3.9	5.2
Administration-Clerical	12.0	16.0	20.1	16.0	20.3	25.0
Legal Counsel	1.0	1.0	1.0	2.5	2.5	3.0
Sub-Total*	19.0	26.0	32.5	26.0	34.5	42.0
OVERALL TOTALS**	49.	67.	83.	68.	89.	107.

Note:

* Rounded-off to the nearest half-man year
** Rounded-off to nearest whole-man year

TABLE 7-5. AVERAGE SALARY ESTIMATES FOR AGENCY OPERATIONS

	Annual
Management Activities	
Professional (25%)	$16,000
Non-Professional (75%)	8,000
Enforcement Activities	
Inspectors	10,000
Engineering Activities	
Engineers	14,000
Technical Services	
Chemists (40%)	10,000
Technicians (60%)	5,000
Fringe Benefits, Facilities and Support, plus Additional Operating Expenses	$33\frac{1}{3}$ % of Base Salary

Table 7-6. ESTIMATED EXPENDITURES FOR OHIO PORTION OF THE MCIAQCR

	FY 71	72	73
Management Operation			
Salaries	192,000	256,000	324,000
Operating Expense	64,000	85,000	108,000
Facilities and Support	5,000	3,500	3,500
	261,000	344,500	435,500
Enforcement Operations			
Salaries	130,000	155,000	175,000
Operating Expense	43,000	51,000	58,000
Facilities and Support	2,000	2,500	2,000
	175,000	208,500	235,000
Engineering Operations			
Salaries	91,000	140,000	189,000
Operating Expense	30,000	46,000	62,000
Facilities and Support	5,000	1,000	1,000
	126,000	187,000	252,000
Technical Service Operations			
Salaries	70,000	105,000	137,500
Operating Expense	23,000	35,000	46,000
Facilities and Support	90,000	46,000	46,600
Capital Expense	183,000	186,600	230,100
for Agency	745,000	926,600	1,152,000
for Region	1,083,400	1,230,350	1,472,450

and two for one matching funds will be provided for new monies put forth by local or state jurisdictions.

A summary of the capital expenditures necessary to support air monitoring activities over the period FY 1971 to FY 1973 is presented in Table 7-7 and included in the costs distributed over the three fiscal years in Table 7-6. It is not possible at this stage in the program plan to provide a more detailed breakdown on the exact capital and facilities expenditures that will be required. The funding levels presented in Table 7-6 represent average expected expenditures but are not based on more detailed cost breakdown information

7.4 PROJECTED STATE AND LOCAL PROGRAMS

The figures concerning proposed levels of funding and staffing were developed on the basis of regional needs for air pollution control. These needs must be considered by the appropriate legislative bodies and balanced against other local, regional and State requirements before actual funding is approved.

During fiscal year 1970 the State of Ohio supported air pollution control efforts in its portion of the MCIAQCR at the level of about $50,000. The City of Cincinnati's Air Pollution Control Department had a budget of $213,000. The number of full-time personnel engaged in control activities during this period was sixteen in the City of Cincinnati and two in the State program.

The 1971 State Budget shows increased State funds available to the region. Approximately $100,000 will be spent by the State or made available for the development of local control agencies within the region. It is expected that these State expenditures will produce Federal matching funds of about $300,000. The City of Cincinnati will continue to support a local air pollution control program at the level of $213,000. The total funds that will be available during fiscal 1971 in the four county Ohio portion of the MCIAQCR will be about $613,000.

TABLE 7-7. ESTIMATED CAPITAL EXPENDITURES FOR THE OHIO PROGRAM WITHIN THE MCIAQCR

Through Fiscal Year 1973		
ITEM	OHIO	REGIONAL TOTALS
Air Monitoring Network		
Continuous Station	\$ 54,000 (3)	\$ 72,000 (4)
Shelter	36,000	48,000
Cont. SO_2 (Recorder)	12,000	16,000
Tape Sampler	3,000	4,000
Hi-Vol Sampler	900	1,200
SO_2 Bubblers	2,100	2,800
Intermittent Station	15,400 (14)	23,400 (2)
Hi-Vol Sampler	4,200	6,300
SO_2 Bubblers	10,500	15,700
Misc. Static	700	1,000
Laboratory Equipment	30,000	50,000
Computer Facilities (Time Sharing)	3,000	5,000
TOTALS	\$171,800	\$244,400

Projected staffing levels based on these expenditures were 30 full-time personnel in local control agencies and six at the State level. While these levels are somewhat below those shown in Tables 7-4 and 7-6, they do represent a significant increase in air pollution control activity and positive step toward achieving the desired program. By continued increases like that described for fiscal year 1971 it will be possible to achieve the stated program goals in terms of both personnel and financial resources.

APPENDIX A

TABLE A-1

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

Stability Class 1

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0001	0.0001	0.0	0.0	0.0	0.0
NNE	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0002	0.0001	0.0	0.0	0.0	0.0
E	0.0001	0.0002	0.0	0.0	0.0	0.0
ESE	0.0001	0.0003	0.0	0.0	0.0	0.0
SE	0.0001	0.0003	0.0	0.0	0.0	0.0
SSE	0.0000	0.0001	0.0	0.0	0.0	0.0
S	0.0001	0.0003	0.0	0.0	0.0	0.0
SSW	0.0001	0.0002	0.0	0.0	0.0	0.0
SW	0.0001	0.0001	0.0	0.0	0.0	0.0
WSW	0.0001	0.0002	0.0	0.0	0.0	0.0
W	0.0002	0.0002	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.0	0.0	0.0	0.0
NW	0.0001	0.0001	0.0	0.0	0.0	0.0
NNW	0.0001	0.0002	0.0	0.0	0.0	0.0

TABLE A-1 (Continued)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

Stability Class 2

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0009	0.0016	0.0006	0.0	0.0	0.0
NNE	0.0007	0.0010	0.0008	0.0	0.0	0.0
NE	0.0012	0.0020	0.0008	0.0	0.0	0.0
ENE	0.0007	0.0012	0.0014	0.0	0.0	0.0
E	0.0007	0.0025	0.0015	0.0	0.0	0.0
ESE	0.0002	0.0012	0.0010	0.0	0.0	0.0
SE	0.0004	0.0013	0.0006	0.0	0.0	0.0
SSE	0.0010	0.0013	0.0006	0.0	0.0	0.0
S	0.0020	0.0021	0.0010	0.0	0.0	0.0
SSW	0.0013	0.0020	0.0012	0.0	0.0	0.0
SW	0.0010	0.0021	0.0010	0.0	0.0	0.0
WSW	0.0008	0.0028	0.0018	0.0	0.0	0.0
W	0.0009	0.0020	0.0014	0.0	0.0	0.0
WNW	0.006	0.0010	0.0011	0.0	0.0	0.0
NW	0.0005	0.0010	0.0007	0.0	0.0	0.0
NNW	0.0003	0.0012	0.0009	0.0	0.0	0.0

TABLE A-1 (Continued)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

Stability Class 3

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0005	0.0012	0.0041	0.0007	0.0001	0.0
NNE	0.0003	0.0014	0.0019	0.0003	0.0	0.0
NE	0.0005	0.0012	0.0031	0.0003	0.0	0.0
ENE	0.0006	0.0009	0.0032	0.0005	0.0	0.0
E	0.0005	0.0017	0.0030	0.0010	0.0	0.0
ESE	0.0002	0.0010	0.0025	0.0003	0.0	0.0
SE	0.0003	0.0016	0.0016	0.0001	0.0	0.0
SSE	0.0003	0.0010	0.0017	0.0001	0.0	0.0
S	0.0010	0.0025	0.0039	0.0006	0.0	0.0
SSW	0.0013	0.0036	0.0052	0.0010	0.0	0.0
SW	0.0009	0.0028	0.0072	0.0016	0.0002	0.0
WSW	0.0007	0.0022	0.0073	0.0012	0.0001	0.0
W	0.0005	0.0022	0.0076	0.0013	0.0001	0.0001
WNW	0.0002	0.0006	0.0039	0.0008	0.0	0.0001
NW	0.0002	0.0010	0.0023	0.0001	0.0	0.0
NNW	0.0002	0.0008	0.0016	0.0002	0.0	0.0

TABLE A-1 (Continued)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL SEASON

Stability Class 4

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0004	0.0051	0.0138	0.0134	0.0009	0.0002
NNE	0.0003	0.0035	0.0089	0.0070	0.0005	0.0001
NE	0.0004	0.0054	0.0101	0.0065	0.0002	0.0001
ENE	0.0006	0.0050	0.0114	0.0058	0.0003	0.0
E	0.0005	0.0062	0.0127	0.0056	0.0002	0.0
ESE	0.0004	0.0051	0.0082	0.0039	0.0003	0.0001
SE	0.0004	0.0044	0.0099	0.0028	0.0001	0.0001
SSE	0.0011	0.0043	0.0091	0.0036	0.0001	0.0
S	0.0016	0.0103	0.0210	0.0119	0.0008	0.0001
SSW	0.0012	0.0077	0.0211	0.0186	0.0028	0.0003
SW	0.0008	0.0074	0.0196	0.0244	0.0039	0.0010
WSW	0.0010	0.0071	0.0156	0.0184	0.0029	0.0008
W	0.0009	0.0076	0.0177	0.0262	0.0052	0.0012
WNW	0.0010	0.0041	0.0130	0.0193	0.0036	0.0001
NW	0.0008	0.0047	0.0089	0.0138	0.0010	0.0001
NNW	0.0002	0.0033	0.0061	0.0070	0.0005	0.0001

TABLE A-1 (Continued)

METEOROLOGICAL INPUT DATA FOR THE ANNUAL ASEASON

Stability Class 5

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0023	0.0067	0.0046	0.0	0.0	0.0
NNE	0.0033	0.0079	0.0030	0.0	0.0	0.0
NE	0.0034	0.0088	0.0030	0.0	0.0	0.0
ENE	0.0039	0.0107	0.0045	0.0	0.0	0.0
E	0.0058	0.0114	0.0043	0.0	0.0	0.0
ESE	0.0055	0.0098	0.0016	0.0	0.0	0.0
SE	0.0047	0.0088	0.0011	0.0	0.0	0.0
SSE	0.0045	0.0092	0.0017	0.0	0.0	0.0
S	0.0148	0.0215	0.0039	0.0	0.0	0.0
SSW	0.0131	0.0261	0.0039	0.0	0.0	0.0
SW	0.0102	0.0166	0.0060	0.0	0.0	0.0
WSW	0.0035	0.0078	0.0041	0.0	0.0	0.0
W	0.0029	0.0089	0.0063	0.0	0.0	0.0
WNW	0.0021	0.0047	0.0035	0.0	0.0	0.0
NW	0.0017	0.0055	0.0029	0.0	0.0	0.0
NNW	0.0009	0.0025	0.0014	0.0	0.0	0.0

TABLE A-2

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 1

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0	0.0	0.0	0.0	0.0	0.0
NNE	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0
ENE	0.0	0.0	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0
ESE	0.0	0.0	0.0	0.0	0.0	0.0
SE	0.0	0.0	0.0	0.0	0.0	0.0
SSE	0.0	0.0	0.0	0.0	0.0	0.0
S	0.0	0.0	0.0	0.0	0.0	0.0
SSW	0.0	0.0	0.0	0.0	0.0	0.0
SW	0.0	0.0	0.0	0.0	0.0	0.0
WSW	0.0	0.0	0.0	0.0	0.0	0.0
W	0.0	0.0	0.0	0.0	0.0	0.0
WNW	0.0	0.0	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.0	0.0
NNW	0.0	0.0	0.0	0.0	0.0	0.0

TABLE A-2 (Continued)

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 2

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0	0.0	0.0	0.0	0.0	0.0
NNE	0.0	0.0	0.0	0.0	0.0	0.0
NE	0.0	0.0	0.0	0.0	0.0	0.0
ENE	0.0005	0.0	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0
ESE	0.0	0.0	0.0	0.0	0.0	0.0
SE	0.0	0.0	0.0	0.0	0.0	0.0
SSE	0.0	0.0	0.0	0.0	0.0	0.0
S	0.0009	0.0	0.0	0.0	0.0	0.0
SSW	0.0005	0.0	0.0	0.0	0.0	0.0
SW	0.0005	0.0	0.0	0.0	0.0	0.0
WSW	0.0005	0.0	0.0	0.0	0.0	0.0
W	0.0005	0.0	0.0	0.0	0.0	0.0
WNW	0.0005	0.0	0.0	0.0	0.0	0.0
NW	0.0	0.0	0.0	0.0	0.0	0.0
NNW	0.0	0.0	0.0	0.0	0.0	0.0

TABLE A-2 (Continued)

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 3

	WINDSPEED CLASS					
WIND DIRECTION	1	2	3	4	5	6
N	0.0000	0.0005	0.0005	0.0	0.0	0.0
NNE	0.0005	0.0	0.0005	0.0	0.0	0.0
NE	0.0001	0.0009	0.0005	0.0	0.0	0.0
ENE	0.0005	0.0005	0.0009	0.0	0.0	0.0
E	0.0000	0.0005	0.0005	0.0	0.0	0.0
ESE	0.0000	0.0005	0.0	0.0	0.0	0.0
SE	0.0000	0.0005	0.0014	0.0	0.0	0.0
SSE	0.0001	0.0009	0.0	0.0	0.0	0.0
S	0.0005	0.0005	0.0014	0.0	0.0	0.0
SSW	0.0011	0.0009	0.0009	0.0	0.0	0.0
SW	0.0002	0.0018	0.0027	0.0	0.0	0.0
WSW	0.0011	0.0014	0.0009	0.0	0.0	0.0
W	0.0000	0.0009	0.0027	0.0	0.0	0.0
WNW	0.0001	0.0009	0.0018	0.0	0.0	0.0
NW	0.0001	0.0014	0.0009	0.0	0.0	0.0
NNW	0.0007	0.0023	0.0023	0.0	0.0	0.0

TABLE A-2 (Continued)

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 4

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0015	0.0100	0.0255	0.0228	0.0009	0.0
NNE	0.0005	0.0050	0.0123	0.0041	0.0	0.0
NE	0.0001	0.0082	0.0087	0.0027	0.0	0.0
ENE	0.0000	0.0032	0.0068	0.0014	0.0	0.0
E	0.0000	0.0032	0.0105	0.0014	0.0	0.0
ESE	0.0010	0.0046	0.0137	0.0064	0.0	0.0
SE	0.0005	0.0059	0.0087	0.0041	0.0	0.0
SSE	0.0010	0.0041	0.0091	0.0055	0.0	0.0
S	0.0015	0.0128	0.0246	0.0132	0.0	0.0
SSW	0.0024	0.0091	0.0150	0.0150	0.0014	0.0005
SW	0.0034	0.0118	0.0219	0.0291	0.0082	0.0014
WSW	0.0011	0.0146	0.0173	0.0314	0.0059	0.0005
W	0.0016	0.0146	0.0392	0.0442	0.0105	0.0009
WNW	0.0006	0.0087	0.0319	0.0364	0.0055	0.0
NW	0.0010	0.0105	0.0250	0.0246	0.0032	0.0
NNW	0.0001	0.0100	0.0114	0.0137	0.0009	0.0

TABLE A-2 (Continued)

METEOROLOGICAL INPUT DATA FOR THE WINTER SEASON

Stability Class 5

WIND DIRECTION	WINDSPEED CLASS 1	2	3	4	5	6
N	0.0014	0.0023	0.0036	0.0	0.0	0.0
NNE	0.0016	0.0036	0.0023	0.0	0.0	0.0
NE	0.0009	0.0023	0.0018	0.0	0.0	0.0
ENE	0.0025	0.0027	0.0046	0.0	0.0	0.0
E	0.0020	0.0064	0.0018	0.0	0.0	0.0
ESE	0.0034	0.0118	0.0009	0.0	0.0	0.0
SE	0.0022	0.0077	0.0014	0.0	0.0	0.0
SSE	0.0018	0.0050	0.0014	0.0	0.0	0.0
S	0.0069	0.0109	0.0032	0.0	0.0	0.0
SSW	0.0051	0.0128	0.0032	0.0	0.0	0.0
SW	0.0104	0.0196	0.0109	0.0	0.0	0.0
WSW	0.0075	0.0077	0.0041	0.0	0.0	0.0
W	0.0022	0.0073	0.0087	0.0	0.0	0.0
WNW	0.0020	0.0027	0.0073	0.0	0.0	0.0
NW	0.0013	0.0082	0.0055	0.0	0.0	0.0
NNW	0.0007	0.0046	0.0014	0.0	0.0	0.0

APPENDIX B

OHIO
AIR POLLUTION
CONTROL
LAWS

1970

AIR POLLUTION CONTROL BOARD
OHIO DEPARTMENT OF HEALTH
COLUMBUS, OHIO

Foreword

The Air Pollution Control Board has prepared this booklet for the convenience of those concerned with or interested in the state laws dealing with the subject of air pollution control.

Section 3701.041 of the Revised Code was passed by the 102nd Ohio General Assembly in 1957, and became effective on September 7, 1957. This law gives authority to the Ohio Department of Health to conduct atmospheric pollution research and advise political subdivisions and others regarding prevention and abatement of atmospheric pollution. It does not grant the Ohio Department of Health regulatory authority but instead limits the department to technical assistance, research and support services.

The regulatory or control function at the state level is performed by the Ohio Air Pollution Control Board. House Bill No. 689, to enact sections 3704.01 to 3704.11 and 3704.99 of the Revised Code relative to the prevention, control and abatement of air pollution, was passed by the 107th Ohio General Assembly and became effective November 28, 1967. Prior to the enactment of this bill, control powers were vested solely in the local political subdivisions of the State. This act is designed to provide a pattern for the regulatory efforts throughout Ohio.

The 105th General Assembly in 1963 added sections 5709.20 to 5709.26, inclusive, of the Revised Code, relative to tax exemptions for air pollution control facilities, to encourage the installation of such facilities for the protection of the public health and welfare. In 1969, the 108th General Assembly amended sections 5709.20 and 5709.21 and added section 5709.27 of the Revised Code.

Sec. 3701.04.1 § 3701.041 Air pollution research.

"Atmospheric pollution" means the presence, in the out-of-door atmosphere, of substances which are injurious to humans, crops, or animals.

The director of health shall:

(A) Maintain a laboratory to provide services necessary for the furtherance of air pollution abatement;

(B) Develop methods of study of atmospheric pollution and conduct research within the state;

(C) Advise, consult, and cooperate with other agencies of the state, the federal government, other states, interstate agencies, political subdivisions, and industries in furtherance of atmospheric pollution prevention and abatement;

(D) Encourage, participate in, or conduct studies and research relating to the prevention of atmospheric pollution;

(E) Collect and disseminate information relating to atmospheric pollution and the prevention, control, and abatement thereof;

(F) Accept and administer grants from the federal government or other sources, public or private, for carrying out any of these functions; all such monies to be deposited in the state treasury, kept by the treasurer of state in a separate fund, and drawn upon by vouchers signed by the director of health.

Sec. 3704.01 Definitions.

As used in sections 3704.01 to 3704.11, inclusive of the Revised Code:

(A) "Air contaminant" means particulate matter, dust, fumes, gas, mist, smoke, vapor or odorous substances, or any combination thereof.

(B) "Air pollution" means the presence in the ambient air of one or more air contaminants or any combination thereof in sufficient quantity and of such characteristics and duration as to injure human health or welfare, plant or animal life, or property, or which unreasonably interfere with the comfortable enjoyment of life or property.

(C) "Ambient air" means that portion of the atmosphere outside of buildings and other enclosures, stacks, or ducts which surrounds human, plant, or animal life, or property.

(D) "Emission" means the release into the outdoor atmosphere of an air contaminant.

(E) "Person" means the state or any agency thereof, any political subdivision, or any agency thereof, public or private corporation, individual, partnership, or other entity.

Sec. 3704.02 Air pollution control board.

There is hereby established in the department of health an air pollution control board composed of the director of health or his authorized representative, the director of development or his authorized representative, and three members appointed by the governor with the advice and consent of the senate.

By reason of his vocation, employment, or affiliation, one of the members appointed shall be classed as a representative of municipal corporations, one as a representative of industry, and one as a representative of agriculture.

Of the members first appointed, one shall be appointed for a term of one year, one for a term of two years, and one for a term of three years. Thereafter, each member shall be appointed for a term of three years. A vacancy on the board shall be filled by appointment for the unexpired term.

Each appointed member of the board shall serve without compensation but shall be paid necessary and reasonable expenses which he incurs while engaged in the performance of official duties as a member of the board.

The director of health or his authorized representative shall be chairman of the board. The director of development or his authorized representative shall be vice-chairman of the board and in the absence or disability of the chairman he shall have the authority to perform the duties of the chairman.

Three members of the board constitute a quorum, and the affirmative vote of three members is necessary for official action of the board.

The board shall hold at least one regular meeting in each quarter of each calendar year, and shall keep a record of its proceedings which shall be open to public inspection.

Special meetings of the board may be called by the chairman and shall be called by him upon a request in writing therefor signed by three or more members of the board.

Written notice of the time and place of each meeting of the board shall be sent to each member of the board by the secretary of the board.

The director of health may exercise in the name of the board all the powers of the board except the power to adopt, modify, or repeal regulations, issue, revoke, or modify orders, or modify or revoke permits.

Sec. 3704.03 Powers of board.

The air pollution control board may:

(A) Develop programs for the prevention, control, and abatement of air pollution;

(B) Advise, consult, and cooperate with any governmental or private agency in the furtherance of the purposes of sections 3704.01 to 3704.11, inclusive, of the Revised Code;

(C) Encourage, participate in, or conduct studies, investigations, and research, relating to air pollution, and the causes, prevention, control, and abatement thereof;

(D) Adopt, modify, and repeal regulations for the prevention, control, and abatement of air pollution, prescribing ambient air quality standards for various areas of the state. In adopting, modifying, or repealing such regulations the board shall hear and give consideration to evidence relating to:

(1) The character and degree of any injury to human health or welfare, plant or animal life, or property, or any unreasonable interference with the comfortable enjoyment of life or property as the result of air pollution;

(2) Conditions calculated to result from compliance with such standards and their relation to benefits to the people of the state to be derived from such compliance;

(3) The quantity and characteristics of air contaminants and the frequency and duration of their presence in the ambient air;

(4) Topography, prevailing wind directions and velocities, physical conditions, and other factors which may or may not combine to affect air pollution.

(E) Adopt, modify, and repeal regulations for the prevention, control, and abatement of air pollution, prescribing for various areas of the state emission standards for air contaminants for the purpose of achieving compliance with air quality standards applicable to such area. In adopting, modifying, or repealing such regulations the board shall hear and give consideration to evidence relating to:

(1) Conditions calculated to result from compliance with such standards and their relation to benefits to the people of the state to be derived from such compliance;

(2) The quantity and characteristics of air contaminants, the frequency and duration of their presence in the ambient air, and the dispersion and dilution of such contaminants;

(3) Topography, prevailing wind directions and velocities, physical conditions, and other

factors which may or may combine to affect air pollution.

(F) Issue, revoke, modify, or deny permits for emissions in excess of the applicable emission standards adopted by the board. In issuing, revoking, modifying, or denying such permits the board shall hear and give consideration to evidence that:

(1) Compliance with such standards is impractical because of conditions beyond the control of the applicant.

(2) Compliance with such standards would be technically infeasible or economically unreasonable.

(3) The emissions of the applicant for which a permit is requested have little effect on ambient air quality because of topography, direction and velocity of prevailing winds, height of emission source, or other factors.

In issuing such permits, the board may also order the person to whom the permit is issued to proceed to take such action within such time as is appropriate and reasonable to prevent, control, or abate his existing emissions of air contaminants.

The board shall specify in such permits that the permit is conditioned upon the right of authorized representatives of the board to enter upon the premises of the person to whom the permit has been issued for the purpose of determining compliance with sections 3704.01 to 3704.11, inclusive, of the Revised Code, rules and regulations adopted thereunder, or the terms of a permit, order, or other determination of the board.

(G) Require the person responsible for any source of emission which may reasonably be considered as being a source of or contributing to air pollution in an area where ambient air standards are being exceeded to file reports with the board containing information which is reasonably available as to location, size and height of emission outlets, and the rate, duration, and composition of emissions;

(H) Establish, operate, and maintain monitoring stations and other devices designed to measure air pollution and to enter into contracts with any public or private agency for the establishment, operation, or maintenance of such stations and devices;

(I) Adopt, modify, repeal, and promulgate rules and regulations governing the procedure of the board with respect to hearings, filing of reports, the adoption of ambient air quality standards, emission standards, the issuance of permits, and all other matters relating to procedure;

(J) Adopt, modify, and repeal regulations requiring the submission of plans and specifications for that portion of proposed installations which may cause air pollution;

(K) Through any individual member or any representative authorized by the board, enter upon private or public property, including improvements thereon, at any reasonable time for the purpose of determining if there are any emissions from such premises, and if so, to determine the sources and extent of such emissions;

(L) Accept and administer grants from the federal government and from any other source, public or private, for carrying out any of its functions;

(M) Obtain necessary scientific, technical, and laboratory services;

(N) Establish advisory boards in accordance with section 121.13 of the Revised Code;

(O) Employ, compensate, and prescribe the powers and duties of such officers, employees, and consultants as are necessary to enable the board to exercise its authority and perform duties imposed upon it by law. Technical and other services shall be performed, insofar as practical, by personnel of the department of health.

(P) Certify to the government of the United States or any agency thereof that an industrial air pollution facility is in conformity with the state program or requirements for control of air pollution whenever such certificate is required for a taxpayer pursuant to any federal law or requirements;

(Q) Exercise all powers incidentally required to carry out the purposes of sections 3704.01 to 3704.11, inclusive, of the Revised Code.

The air pollution control board shall develop a plan to control air pollution resulting from state-operated facilities and property.

Sec. 3704.04 Regulations subject to administrative procedures act.

The adoption, modification, and repeal of regulations under divisions (D) and (E) of section 3704.03 of the Revised Code and the issuance, revocation, modification, and denial of permits under division (F) of section 3704.03 of the Revised Code shall be in accordance with sections 119.01 to 119.13, inclusive, of the Revised Code, except that the notice of appeal required under section 119.11 of the Revised Code shall not stay the effective date of any regulation adopted under division (D) or (E) of section 3704.03 of the Revised Code. Such a stay may be granted by the court for good cause but shall be effective only as to the party appealing the order adopting, modifying, or repealing such regulations.

Sec 3704.05 Prohibitions.

(A) No person shall cause, permit, or allow emission of an air contaminant in violation of a standard for emission of such contaminant adopted by the air pollution control board under division (E) of section 3704.03 of the Revised Code, unless such person is the holder of a permit issued under division (F) of section 3704.03 of the Revised Code, permitting the emission of such contaminant in excess of such standard.

(B) No person who is the holder of a permit issued under division (F) of section 3704.03 of the Revised Code shall cause, permit, or allow emission of an air contaminant or contaminants listed therein in violation of the conditions of such permit or fail to obey an order of the board issued under authority of such division.

(C) No person shall fail to submit reports as may be required under division (G) of section 3704.03 of the Revised Code.

(D) No person shall refuse entry to a member of the board or its authorized representative as provided in divisions (F) and (K) of section 3704.03 of the Revised Code, or hinder or thwart such person in making such investigation.

(E) No person shall fail to submit plans and specifications as required by division (J) of section 3704.03 of the Revised Code.

Sec. 3704.06 Prosecution by attorney general; injunction.

The attorney general, upon the request of the air pollution control board, shall prosecute any person who violates section 3704.05 of the Revised Code.

The attorney general, upon request of the board, shall bring an action for an injunction or any other appropriate proceedings in any court of competent jurisdiction against any person violating or threatening to violate section 3704.05 of the Revised Code. The court in which an action for injunction is filed has jurisdiction to grant injunctive relief. The court shall give consideration to the physical and economic feasibility of complying with such standards as may be applicable and shall have jurisdiction to enter such judgment, and orders enforcing such judgment, as the public interest and equities of the case require.

Sec. 3704.07 Exemption within properties.

Nothing contained in sections 3704.01 to 3704.11, inclusive, of the Revised Code, shall be construed as authorizing the air pollution control board to make any rule, regulation, determination, or order which:

(A) Is with respect to the condition or quality of the outdoor atmosphere within the boundaries of the industrial property within which the air contaminants are or may be emitted;

(B) Affects the relations between employers and employees;

(C) Supersedes or limits the applicability of any law or ordinance relating to industrial health, safety, or sanitation within the boundaries of the industrial property.

Sec. 3704.08 Records confidential.

Any records or information relating to secret processes or secret methods of manufacture or production which may be obtained by the air pollution control board or other persons acting under sections 3704.01 to 3704.11, inclusive, of the Revised Code, are confidential and shall not be disclosed except when such records or information are necessary to sustain an injunction or to refuse a permit during a public hearing by the board.

Sec. 3704.09 Determinations not to be used in civil actions.

Determinations made by the air pollution control board or other persons acting under sections 3704.02, 3704.03, and 3704.04 of the Revised Code and determinations made by courts under sections 3704.05, 3704.06, and 3704.99 of the Revised Code shall not be used as evidence in civil actions nor create any presumption of law or finding of fact which shall inure to or be for the benefit of any person other than the state, and sections 3704.01 to 3704.07, inclusive, of the Revised Code do not create, enlarge, or abrogate existing private rights.

Sec. 3704.10 Motor vehicle emissions exempt.

Divisions (D), (E), (F), and (G) of section 3704.03, and section 3704.04, of the Revised Code do not apply to emissions from motor vehicles.

Sec. 3704.11 Authority of a political subdivision not limited.

Sections 3704.01 to 3704.11, inclusive, of the Revised Code do not limit the authority a political subdivision of the state has to adopt and enforce ordinances or regulations relative to the prevention, control, and abatement of air pollution.

Sec. 3704.99 Penalty.

Whoever violates any provision of section 3704.05 of the Revised Code, shall be fined not more than five hundred dollars. Each day such violation continues after a conviction for a violation is a separate offense.

Sec. 5709.20 Definition of air pollution control facility.

As used in sections 5709.20 to 5709.27, inclusive, of the Revised Code:

(A) "Air contaminant" means particulate matter, dust, fumes, gas, mist, smoke, vapor, or odorous substances, or any combination thereof.

(B) "Pollution control facility" means any property designed, constructed, or installed for the primary purpose of eliminating or reducing the emission of, or ground level concentration of, air contaminants which renders air harmful or inimical to the public health or to property within this state.

Facilities designed, constructed, installed, used, or placed in operation solely for the safety, health, protection, or benefit, or any combination thereof, of personnel, or by a business solely for its own benefit, are not pollution control facilities.

Sec. 5709.21 Certification procedure.

Application for a pollution control certificate shall be filed with the tax commissioner in such manner and in such form as may be prescribed by regulations issued by the commissioner and shall contain plans and specifications of the structure or structures including all materials incorporated and to be incorporated therein and a descriptive list of all equipment acquired or to be acquired by the applicant for the purpose of pollution control. If the commissioner finds that the proposed facility was designed primarily for the control of pollution of the air, as defined in section 5709.20 of the Revised Code, and is suitable and reasonably adequate for such purpose and is intended for such purpose, he shall enter a finding and issue a certificate to that effect. Said certificate shall permit tax exemption pursuant to section 5709.25 of the Revised Code only for that portion of such pollution control facility or that part used exclusively for air pollution control. The effective date of said certificate shall be the date of the making of the application for such certificate or the date of the construction of the facility, whichever is earlier; provided, that if such application relates to facilities placed in operation or capable of operation prior to the effective date of this act, the effective date of the certificate shall be the date of the application.

Sec. 5709.22 Powers and duties of tax commissioner.

Before issuing any certificate the tax commissioner shall give notice in writing by mail to the auditor of the county in which such facilities are located, and shall afford to the applicant and to the auditor an opportunity for a hearing. On like notice to the applicant and opportunity for a hearing, the commissioner shall on his own initiative or on complaint by the county auditor of the county in which any property to which such pollution control certificate relates is located, revoke such pollution control certificate whenever any of the following appears:

(A) The certificate was obtained by fraud or misrepresentation;

(B) The holder of the certificate has failed substantially to proceed with the construction, reconstruction, installation, or acquisition of pollution control facilities;

(C) The structure or equipment or both to which the certificate relates has ceased to be used for the primary purpose of pollution control and is being used for a different purpose.

Provided, that where the circumstances so require, the commissioner in lieu of revoking such certificate may modify the same by restricting its operations.

On the mailing of notice of the action of the commissioner revoking or modifying a pollution control certificate as provided in section 5709.23 of the Revised Code, such certificate shall cease to be in force or shall remain in force only as modified as the case may require.

Sec. 5709.23 Notice to applicant and county auditor.

A pollution control certificate, when issued, shall be sent by certified mail to the applicant and notice of such issuance in the form of certified copies thereof shall be sent by certified mail by the tax commissioner to the county auditor of the county in which any property to which the same relates is located and shall be filed of record in his office.

Notice of the order of the commissioner denying, revoking, or modifying a pollution control certificate in the form of certified copies thereof shall be sent by certified mail to the applicant or the holder thereof and to such county auditor, as the case may require. The applicant or holder and such county auditor in the proper case are deemed parties for the purpose of the review afforded by section 5709.24 of the Revised Code.

Sec. 5709.24 Appeal.

Any party aggrieved by the issuance or refusal to issue, revocation, or modification of a pollution control certificate may appeal from the finding and order of the tax commissioner to the board of tax appeals in the manner and form and within the time provided by section 5717.02 of the Revised Code.

Sec. 5709.25 Taxes exempt.

For the period subsequent to the effective date of said pollution control certificate and continuing so long as said certificate is in force, no pollution control facility or certified portion thereof shall be considered:

(A) An improvement on the land on which the same is located for the purpose of real property taxation;

(B) As "used in business" for the purpose of personal property taxation;

(C) As an asset of any corporation in determining the value of its issued and outstanding shares or the value of the property owned and used by it in this state for the purpose of the franchise tax. The transfer of tangible property to the holder of a pollution control certificate shall not be considered a "sale" of such tangible personal property for the purpose of the sales tax, or "use" for the purpose of the use tax, if said tangible personal property is to be or was a material or part to be incorporated into a pollution control facility as defined in section 5709.20 of the Revised Code.

Sec. 5709.26 Liability in case of fraud.

When a pollution control certificate is revoked because obtained by fraud or misrepresentation, all taxes which would have been payable had no certificate been issued shall be assessed with maximum penalties prescribed by law applicable thereto.

Sec. 5709.27 Exemption certificate, transfer.

In the event of the sale, lease, or other transfer of a pollution control facility, not involving a different location or use, the holder of a pollution control certificate for such facility may transfer the certificate by written instrument to the person who, except for the transfer of the certificate, would be obligated to pay taxes on such facility. The transferee shall become the holder of the certificate and shall have all the rights to exemption from taxes which were granted to the former holder or holders, effective as of the date of transfer of the facility or the date of transfer of the certificate, whichever is earlier. The transferee shall give written notice of the effective date of the transfer, together with a copy of the instrument of transfer, to the tax commissioner and the county auditor of the county in which the facility is loacted.

APPENDIX C

REGIONAL ORGANIZATIONAL STRUCTURE

PURPOSE OF REGIONAL EXAMINATION

An effective air pollution control program must be based on a complete technical evaluation of the conditions in the control area. This evaluation is necessary but not in itself sufficient. The question of political control and administration of the control agency among and within the various jurisdictions is also vital to the development of a functioning program.

Two closely related problems had to be resolved for this Implementation Plan with regard to the acceptability on a political level of its recommendations for an air pollution control regional organization:

1. The MCIAQCR overlaps three states; Ohio, Kentucky, and Indiana, with a total of nine counties in the three states. Instead of one authority which could impose an implementation plan on subordinate political subdivisions, this study dealt with three independent sovereign states. Agreement to cooperate had to be obtained, with no single authority that could force consent.
2. Each part of the MCIAQCR is located in two distinct areas, its state and the region. NAPCA understandably is looking primarily toward a regional plan, because MCIAQCR is one airshed. Each state, however, looks upon its portion of the region as simply a part of the state. Each state board has state-wide responsibility for air quality. The two, three, or four counties of the state which happen to be located in the region are no different, in the eyes of each state board, than any other counties in the state.

These basic problems had been anticipated in the development of the Plan. A methodology was developed by which various organizational alternatives could be tested (Section 3.3). This procedure was carried out to insure that completed Implementation Plans would be both technically and politically feasible.

ORGANIZATIONAL ALTERNATIVES

Four organizational alternatives were considered in performing the political acceptability analysis:

1. Interstate Compact. All control agency functions would be delegated by the states with Federal approval to a central interstate agency.
2. Interstate Agreement. All of the program except legal enforcement, which would be retained by the states, would be handled by an interstate agency. This organization avoids the need for Congressional approval of a compact.
3. Intrastate Enforcement with a Central Cooperating Mechanism. Basic control authority and operations are retained at the state level.
4. County Enforcement with a Central Cooperating Mechanism.

Each of the above, except the compact, provided a number of suboptions which had to be considered. A description of these four basic plans, including legal considerations and the organization's function in the control of emergency episodes was prepared.

These four alternatives were selected to represent possible methods of controlling and administering an air pollution control program in the MCIAQCR. The following analytic effort was undertaken to determine which of these alternatives would be most appropriate in terms of citizen and political acceptance within the Region.

ANALYSIS

In order to determine which of the above alternatives would best meet the needs of the MCIAQCR, it was necessary to present them to a cross-section of area citizens and leaders. A seminar technique was utilized for this purpose since a full explanation of the various organizations could be presented. The seminar also provided a forum for discussion and comments regarding the various alternatives. A seminar was scheduled for each of the three states and a group consisting of members of the state legislature, the state air pollution control board, city officials, and concerned citizens was invited to attend. The seminar plan provided for a morning session in which the alternatives, including their legal implications and plans for emergency episode control were explained. Following lunch, the study team answered questions from the participants and generally noted the reactions to the proposals, and thus got a feedback as to what was considered to be the most acceptable organizational alternative.

The Ohio Seminar was held on April 3, 1970 at the Holiday Inn, Downtown, Cincinnati and although attendance was somewhat below expectations, the meeting was considered to be a success. The participants did react and did provide the staff with clear ideas concerning their views on what was acceptable. To verify whether or not this reaction represented also the feeling of concerned legislative leaders, one staff member met separately with selected legislators.

The substance of the Ohio reaction was that Ohio's agreement to an interstate compact was contingent upon agreement by the other states. The general consensus was that a plan for intrastate enforcement by the state board would be preferred.

The next seminar, scheduled for April 17, 1970 in Indiana, had a substantially larger guest list than that for Ohio. However, in spite of this larger list of invitees, practically no reservations were received even in response to telephone followup. The meeting was therefore canceled. The reasons appeared to be most important: (1) a conflict of dates with another meeting, and (2) indifference to the interstate aspects of air pollution control. Only two small Indiana counties are included in the MCIAQCR, with a total population of 30,000. Other Indiana and Kentucky counties contiguous to these counties are essentially rural, with no serious pollution problems. Furthermore, the state board had been reasonably active for some time, and apparently was thought to be equal to the task.

The Kentucky meeting, April 24, 1970 at the Holiday Inn in Covington, produced a turnout of 50, plus staff. This turnout resulted from several causes: (1) a high level of interest in pollution control, (2) an expanded list of invitees; and (3) inclusion of Indiana residents who had been interested in a meeting, but had not been able to attend when originally scheduled.

The same format was followed as at the Ohio meeting, but with a larger audience, greater participation resulted. The message was unmistakable. Kentucky was proud of its control program, and wanted no part of a compact or any other device that might dilute the authority and responsibility of the State Board. The audience was virtually unanimous in insisting on a state program (alternative 3), with a willingness to cooperate with other states provided this cooperation did not dilute state responsibility. The Indiana citizens shared the Kentucky viewpoint.

The basic objective of this phase of the analysis was thus satisfied with the identification of intrastate control programs with some interstate cooperation as the desired organizational form.

Nevertheless, the two meetings had come to grips only with the basic plan. Assuming control by the state boards in their receptive areas, two questions remained:

1. To what extent, and in what areas, would there be cooperation among the states?
2. Through what mechanism would this cooperation be exercised?

To resolve these problems, a third meeting was called, this time limited to representatives of the three state boards, the City of Cincinnati, one concerned legislator, and representatives of the Ohio-Kentucky-Indiana Regional Planning Authority, the recognized planning agency for the nine counties of the MCIAQCR.

The various representatives quickly agreed that cooperation was necessary. They pointed out that for many months, they had cooperated through an ad hoc device known as the Air Pollution Control Officers Committee.

They also agreed that, to the extent interstate planning would be needed after implementation, this would require an interstate mechanism.

As a group, the meeting failed to define any role for the OKI Regional Planning Authority. This perhaps came about because of the existence of one well-established agency, the City of Cincinnati, in the heart of the region. The City, as will be described more fully in sections 5 and 8 of this report, is recommended as the agent of the State of Ohio under contract for air quality control in the four Ohio counties. It has expertise. It also has a powerful data processing unit, with ample capacity to serve as the regional data bank. The consensus was that the City of Cincinnati agency is a more logical data bank, so that this data can be most useful particularly in emergency episode control.

ORGANIZATIONAL RECOMMENDATIONS

The seminars indicated which of the various organizational alternatives would be politically viable in the MCIAQCR. Based on the procedure described above, the following general recommendations are presented. (Sections 3, 6, 7, describe in some detail how these recommendations are to be implemented.)

1. Responsibility for air quality control in the MCIAQCR should be lodged in the respective state boards.
2. The Ohio and Kentucky boards should establish district offices within the region, with appropriate staff. Indiana should continue to operate from its present headquarters in Indianapolis.
3. Ohio can best develop a capability by contracting with the City of Cincinnati and other municipal air pollution control agencies to service the four Ohio counties.
4. Coordination of efforts among the three states should be achieved as follows:
    a. The City of Cincinnati, as part of its contract with the Ohio Board, should assume responsibility for maintaining a regional data bank.
    b. The existing Air Pollution Control Officers Committee should continue its existence as a cooperation mechanism.
    c. This Committee should establish its meeting place in the offices of the OKI Planning Authority. The staff of the Planning Authority should be used for staff to the Committee when necessary. Whenever interstate planning or any other unforeseen studies are necessary, the staff of the Planning Authority should be used.
    d. While responsibility for air pollution control rests with the three respective boards, the OKI Regional Planning Authority board is the only existing mechanism for bringing together the elected officers of the counties comprising MCIAQCR. As such, this board could be used as necessary by the state boards as a means of determining local attitudes.
5. Financing of air quality control is a matter for each state board.

EPISODE ORGANIZATION

The Air Pollution Control Officers Committee will have overall responsibility for promoting interstate planning for air pollution episodes. Because the Committee will have numerous, diverse responsibilities, a separate, subordinate organization is expressly recommended for episode planning purposes. This organization will be called the Region Episode Board. The Board will be comprised of one member from each state in the MCIAQCR. It is possible that members of the Committee may serve as members of the Episode Board. Alternatively, a member from the state agency expressly responsible for state episode planning may be a superior candidate for the Board position.

The Board will have planning and operating responsibilities. During the first few years, the Board will be responsible for developing episode avoidance procedures for the Region. Such procedures are briefly outlined in Section 5 of this report. The board will also assume limited responsibilities for actions during episodes. The actions will be in the form of recommendations to each state at the more severe stage of an episode (i.e., actions which have interstate consequences such as restrictions on automobile travel or shutdown of commercial business activity).

The Board will routinely (e.g., bi-monthly) meet to perform the necessary planning functions. During episodes, the Board will conduct emergency meetings when the Alert stage is reached.

The Board will meet in the office of the OKI Planning Authority for routine meetings. Meetings during episodes will be held at the office of the City of Cincinnati air pollution agency or , when developed, the Ohio District Office for the MCIAQCR.

Staff members from the three states will be used to coordinate and conduct background studies for the purpose of developing an Emergency Episode Plan. When possible, members of the OKI staff will also participate.

See Section 5.1.1 for further discussion on the MCIAQCR Episode Organization.

One regional Emergency Operations Control Center (EOCC) will serve the MCIAQCR. The required facilities will be located in the City offices in downtown Cincinnati, Ohio.

The routine operation of the EOCC will be conducted by the City of Cincinnati staff. During non-episode periods, such operations are minimal. The routine watch of air quality and meteorological conditions will be a part-time responsibility of one of the professional staff. Under normal conditions there will be no extensive distribution of air quality or meteorlogical data to any of the state organizations.

The presently active Air Pollution Control Officers Committee will have overall responsibility for promoting interstate planning for air pollution episodes. The Committee will have planning responsibilities during non-episode periods and will participate in decision-making operations during episodes. During an 18 month period after the submission of the Implementation Plan, the Committee will be responsible for developing episode alert procedures for the Region. Such procedures are briefly outlined in Section 5 of this report. The Committee will routinely meet to perform the necessary planning functions. Such meetings will be held at the EOCC.

The manner in which the members of the Committee organize during episodes is dependent upon the size of the geographical area affected by the episode. There are essentially two distinct cases; localized episodes and regionwide episodes. Under both situations, all surveillance information will be received and evaluated by the MCIAQCR EOCC. In the case of a localized episode (i.e., an episode which affects a part of one state), the control officers will communicate via telephone; but episode actions will be taken only by the control official in the state affected. When a regionwide episode occurs, the members of the Committee will meet at the MCIAQCR EOCC to plan unified actions.

The episode organization for the MCIAQCR will operate effectively because of uniformity of episode criteria and control actions by the states. The combined air quality monitoring networks of the three states involved will effectively serve the EOCC.

Staffing and funding the EOCC by the three states is a consideration that will be resolved by the Air Pollution Control Officers Committee. Naturally, each state will contribute agency personnel to help run the EOCC during episodes. The size of the staff and procedures followed will be determined by the Committee and published in the Standing Operating Procedures for the EOCC.

EXISTING INTERSTATE COOPERATION

Representatives of the governmental jurisdictions encompassed by the MCIAQCR are acutely aware of the necessity for a coordinated program to control air pollution in the Region. Following the designation of the Metropolitan Cincinnati Interstate Air Quality Control Region, an Air Pollution Control Officers Committee was formed for the Region. Following are excerpts from the document which established the Metropolitan Cincinnati Interstate Air Quality Control Region Air Pollution Control Officers Committee.

> . . . This document, concurred in by representatives of the air pollution control agencies of the States of Ohio and Indiana, the Commonwealth of Kentucky, and the City of Cincinnati, Ohio, is designated to set forth basic policies of interjurisdictional cooperation in the area designated by the Secretary of Health, Education and Welfare as the Metropolitan Cincinnati Air Quality Control Region (hereinafter referred to as the "Region"). The purpose of this document is to establish a flexible mechanism whereby the control officers within the Region can readily exchange information and data of common interest, and coordinate, insofar as possible, each other's control programs so as to achieve optimum utilization of data and avoid unnecessary expense and duplication of effort. This document is intended to set forth an informal arrangement by and between the control officers of the aforesaid agencies, and the policies expressed herein should not be construed to be official policy of any of the control agencies represented.
>
> Policies and Procedures
>
> I. Name: The organization shall be known as the Metropolitan Cincinnati Interstate Air Quality Control Region - Air Pollution Control Officers Committee (hereinafter referred to as the "Committee").
>
> II. Membership: Representatives of the following governmental air pollution control agencies shall be members of the Committee:
>
> The State of Ohio
> The State of Indiana
> The Commonwealth of Kentucky

The City of Cincinnati, Ohio

III. Designated Representatives: For purposes of giving notice, meetings, exchanging data and other pertinent information, etc., the following are designated as the Representatives for each respective control agency:

The State of Ohio -

The State of Indiana -

The Commonwealth of Kentucky -

The City of Cincinnati, Ohio -

IV. Federal Representation: Due to the impact of the Air Quality Act on the control efforts of the various agencies having jurisdiction within the Region, and the desire of the representative control officers to be informed of federal activities and available technical assistance which may inure to each other's benefit, it is felt that federal representation on the Committee would be appropriate and advantageous. Therefore, it is mutually agreed that an official of the National Air Pollution Control Administration shall be invited to attend and participate in all activities of the Committee, such official's name upon designation to be appended to this document.

V. Organization, Meetings, Minutes:

A. Organization - The organizational conduct of the Committee meetings shall be as informal as possible. The Committee shall have no permanent chairman or secretary, but shall, at the discretion of the members, delegate such responsibilities and duties in an equitable manner.

B. Meetings - It is felt that the purposes of the Committee can, for the most part, be achieved by routine correspondence and telephone communications. Therefore, the Committee shall have no regularly scheduled meetings, but shall meet at a mutually agreeable time and place on the call of one of the members when matters of importance arise.

C. Minutes - Minutes of Committee meetings shall be recorded and distributed to the members by the person designated as the secretary for the meeting.

VI. Program Coordination: The representative control officers will attempt, insofar as possible, to establish program efforts within the Region consistent with the following practices and procedures:

A. Reference System - Data points shall be keyed to the Universal Transverse Mercator System referenced to principal coordinates of 39° 12' 30" latitude, and 84° 27' 30" longitude, which locate a central point in the Region in the vicinity of U. S. Interstate I-75 and Amity Road, Cincinnati, Ohio. Graphic presentations of data using a grid system shall be consistent with Universal Transverse Mercator System, with grid size, depending on need, ranging from one to twenty-five square kilometers.

B. Air Quality Monitoring - Preferred general practices for air quality monitoring shall be determined by the Designated Representatives for:

1. Equipment
2. Sampling Schedules
3. Laboratory Procedures
4. Data Reporting Factors

C. Emission Information - Point source emission data shall, insofar, as practicable, be obtained and reported in a consistent manner.

VII. Exchange of Information: It is the intention of the Committee members that information and data of common interest should be freely exchanged between the representative control agencies. Such exchange shall be directed to the Designated Representative for each respective control agency. Without limiting the scope of exchange, the following matters will form the basis of interjurisdictional exchange of information and data:

A. Legislative and Administrative: The representative control agencies shall exchange copies of enabling legislation, adopted regulations or ordinances, annual reports, and any other pertinent information relative to control activities within the Region.

B. Proposed Standards - The representative control agencies shall forward prior to publication copies of proposed ambient air quality and emission standards applicable to any portion of the Region for the Committee member's review and comment. Notice of any public hearings held relative to the adoption of said standards shall be given the Committee through each control agency's Designated Representative.

C. Air Quality Monitoring Data - The representative control agencies shall exchange summary tabulations of air quality monitoring results for each agency's jurisdiction on a periodic basis as such summaries become available.

D. Source Emission Data - Insofar as consistent with the confidentiality requirements of each control agency's enabling legislation, specific point source emission information shall be available for any Committee member's review in the offices of the agency possessing such information. Mass emission data not making specific reference to any particular plant or industry will be freely exchanged between the Committee members through the Designated Representatives.

VIII. Expression of Intent: The undersigned hereby witness that they concur with the aforesaid purposes and objectives, and that they recognize the desirability and indeed the necessity of coordination of technical matters in interstate areas of joint interest and concern. It is understood that no legal liabilities or other binding committments are hereby made, but that a positive intent for cooperation in all the above matters is expressed .

/s/ Samuel I. Lord, Jr. 11/10/69
Kentucky Air Pollution Control Comm.

/s/ A. C. Offutt, M.D. 11/25/69
Indiana Air Pollution Control Board

/s/ E. W. Arnold, M. D. 12/69
Ohio Air Pollution Control Board

/s/ R. L. Krabach 12/69
City of Cincinnati Air Pollution
Control Board